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Caring for oral health in Australian residential care

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Dedication

This publication is dedicated to the memory of Dr Jane Margaret Chalmers (1965–2008) who passed away on 6 December 2008 in Iowa City, USA, following a long illness.

The AIHW Dental Statistics and Research Unit and co-authors of this publication wish to acknowledge Jane, as the principal author of this publication, for her leadership and valuable contributions to the field of geriatric dentistry.

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Abbreviations

ADOH	Activities of Daily Oral Hygiene
BOHSE	Brief Oral Health Status Examination
CNA	certified nursing assistants
CODE	Clinical Oral Disorder in Elders Index
DON	Director of Nursing
GOHAI	Geriatric Oral Health Assessment Index
MDS	Minimum Data Set
MPS	Mucosal Plaque Score (Index)
NHMRC	National Health and Medical Research Council
NIDR	National Institute of Dental Research
OHAT	Oral Health Assessment Tool
OHCP	Oral Hygiene Care Plan
ppm	parts per million
RACF	Residential aged care facilities
WHO	World Health Organization

Abbreviations of places

NSW	New South Wales
SA	South Australia
Vic	Victoria

Symbols

–	nil or rounded to zero
. .	not available
n	number
ppm	parts per million
s.d.	standard deviation
sig.	significant

Summary

Within the increasing older Australian population, there is a significant group at very high risk for developing complex oral diseases and dental problems—institutionalised older adults in Australian residential care facilities. There are abundant general health, functional, cognitive, social and financial problems among this group of high-risk older adults. These problems are associated not only with their development of oral diseases, such as dental caries, but with the many barriers they encounter to accessing adequate dental care. In the Australian residential aged care community, it is the carers who play an essential role in the delivery of oral hygiene care and the maintenance of residents' oral health. Better integration of carers into oral hygiene care delivery and the timely identification of oral health problems are essential in improving residents' access to and equity in oral health.

This study investigated the role of carers in Australian residential care facilities in maintaining adequate oral health for residents, and improving their timely referral and access to dental professionals. Three aspects of best practice were used in this research. The first was to assist participating facilities to develop comprehensive and appropriate oral and dental care policies and procedures, in accordance with Commonwealth Residential Aged Care Standards. The second was to train carers to use an Oral Health Assessment Tool (OHAT), a modified version of the Kayser-Jones Brief Oral Health Status Examination (BOHSE) (Kayser-Jones et al. 1995). The study then assessed the reliability and validity of carers' use of the tool in monitoring and assessing residents' oral health. The third was to use an Oral Hygiene Care Plan (OHCP) developed as part of an evidence-based oral health protocol for carers of dependent older adults (Blanco & Chalmers 2001).

The aims of this study were to:

- establish best practice oral health policies and procedures for participating residential care facilities, in accordance with the Commonwealth Residential Aged Care Oral and Dental Standard 2.15
- trial, over a 6-month period, the use by carers of an Oral Health Assessment Tool in randomly selected Australian residential care facilities, in conjunction with residents' 3-monthly care plan reviews
- trial, over a 6-month period, the use by carers of an Oral Hygiene Care Plan in Australian residential care facilities, in conjunction with residents' 3-monthly care plan reviews
- test the reliability and validity of carers' use of the Oral Health Assessment Tool over a 6-month period in Australian residential care facilities.

A total of 21 residential care facilities in New South Wales, Victoria and South Australia completed this study. Approval was obtained from the appropriate administrators/directors of nursing at each residential care facility and, where required, by the Human Research Ethics Committee for any affiliated Regional Health Organisations. Of the 534 residents who participated at baseline, 455 completed the three study phases. Thus, a complete data set was collected for these 455 residents comprising: OHATs at baseline, 3 months and 6 months; two OHAT reliability exams at 3 months; and OHCPs at baseline, 3 months and 6 months. Mean age of the

455 participating residents was 82.1 years. Of the residents participating, 56.5% had a diagnosed dementia, 88.9% were in Residential Care Services (RCS) 1–4 and 68.7% had resided at the facility for more than 12 months. A questionnaire concerning each facility's dental policies and procedures was completed at baseline and at the end of the study. All facilities improved their scores on this questionnaire over the study period.

Mean total OHAT scores decreased significantly from the baseline score over the study period from 2.71 at baseline to 2.5 at 3 months and 2.4 at 6 months. There were no significant differences in category scores. The highest mean scores were for natural teeth, followed by dentures and oral cleanliness.

OHAT reliability was analysed both for an individual carer (intra-examiner) and between carers (inter-examiner) for each participating resident. Intra-examiner percentage agreement for individual categories ranged from 74.4% for oral cleanliness to 93.9% for dental pain and 96.6% for referral to a dentist. Intra-examiner Kappa statistics were in the moderate range (0.51–0.60) for lips, saliva, oral cleanliness and referral to a dentist. All other categories had an intra-examiner Kappa statistic in the range of 0.61–0.80, indicating substantial agreement. The Pearson correlation coefficient for intra-examiner total OHAT score was 0.78, and all intra-examiner analyses were statistically significant.

Inter-examiner percentage agreement for individual categories ranged from 72.6% for oral cleanliness to 92.6% for dental pain and 96.8% for referral to a dentist. Inter-examiner Kappa statistics were in the moderate range (0.48–0.60) for lips, tongue, gums, saliva, oral cleanliness and referral to a dentist. All other categories had an inter-examiner Kappa statistic in the range of 0.61–0.80, indicating substantial agreement. The Pearson correlation coefficient for inter-examiner total OHAT score was 0.74, and all inter-examiner analyses were statistically significant. These intra- and inter-carer reliability scores were similar or higher than previous studies with the Kayser-Jones BOHSE. However, ongoing problematic categories were saliva, oral cleanliness and dental pain, which require further research.

Percentage agreement and Pearson correlation analyses were completed between individual OHAT categories and associated dental examination findings (using standardised assessments and indices) for 21 residents. There was complete agreement on scoring for the lips. Natural teeth, dentures and tongue had the highest significant correlations and high percentage agreements, and the gums also had a significant but lower correlation. Non-significant and low correlations and percentage agreements were evident for saliva, oral cleanliness and dental pain.

Focus group discussions and questionnaires were conducted at baseline and during the study. Themes identified were:

- access to dental care
- organisational issues
- residents with dementia and uncooperative residents
- oral assessments
- preventive oral hygiene care products
- cleaning teeth
- bleeding gums
- dentures
- infection control
- staff training.

The great majority of carers responded positively to the statements on the focus group questionnaires concerning the use and completion of the OHAT and OHCP, and generally found them practical and easy to use. The self-reported mean time taken to complete the OHAT was 7.8 minutes and the OHCP 8.3 minutes. More time was needed for those residents with dementia and behavioural difficulties. Other comments included: 'it was very interesting as we looked better than we would normally look'; 'this (is) now infiltrating among staff so that it is second nature'; 'we are now doing a dental audit for all new residents'; 'everyone knows it is an issue that needs to be looked at'.

In this study, the use of oral and dental policies and procedures, an Oral Health Assessment Tool and an Oral Hygiene Care Plan improved carers' involvement in the maintenance of residents' oral health and the delivery of oral hygiene care in Australian residential care facilities. The OHAT was evaluated as being a reliable and valid screening tool for use among residents in Australian residential care facilities, including those with cognitive impairments.

1 Introduction

1.1 Oral health in residential care

Within the increasing older Australian population, there is a significant group at very high risk of developing complex oral diseases and dental problems—institutionalised older adults in Australian residential care facilities. There are abundant general health, functional, cognitive, social and financial problems among this group of high-risk older adults. These problems are associated not only with their development of oral diseases, such as dental caries, but with the many barriers they encounter to accessing adequate dental care.

A growing body of research is being published concerning the oral health status of older adults who are institutionalised in residential aged care facilities. Studies have shown evidence of high levels of oral disease and conditions experienced by many of these residents, including coronal and root caries, gingivitis, plaque accumulation, oral mucosal lesions and denture problems (Berkey et al. 1990; Chalmers et al. 2002; Dolan & Atchison 1993; Locker 2003; Stubbs & Riordan 2002; Wyatt 2002). The recently conducted Adelaide Dental Study of Nursing Homes has reported very high levels of dental caries and other oral problems in residents. Perhaps of most concern were the very high levels of plaque accumulation on residents' natural teeth and dentures, which places them at high risk for developing aspiration pneumonia (Chalmers et al. 2002). Researchers have endeavoured to quantify the barriers that frequently impede residents' access to dental treatment, studying samples of dental professionals, administrators, nurses and care staff (Berkey et al. 1988; Chalmers et al. 2001; MacEntee et al. 1992; Weiss et al. 1993; Gift et al. 1998; Weeks & Fiske 1994; Johnson & Lange 1999). An abundance of literature has trialled, recommended and reviewed a great variety of oral hygiene care strategies, programs and staff educational/training initiatives (Blanco & Chalmers 2001; Connell et al. 2002; Frenkel 1999; Kambhu & Levy 1993; Matear 1999; Reese 2002; Simons et al. 2000; Wardh et al. 2000). However, very little of this research has shown long-term maintenance or improvement of residents' oral health status. Many dental professionals continue to struggle to provide dental treatment, institute preventive oral care recommendations, and reduce the progression of caries and other oral diseases and conditions for their institutionalised patients, especially those with dementia.

One of the more interesting and enlightening studies that has been published investigated the core issue of why oral health can be a conflicting priority in residential (long-term) care (MacEntee et al. 1999; Thorne et al. 2001). A qualitative approach using interviews with staff, residents and family members compared differing human resource and organisational strategies that are in place in residential care for managing the provision of oral health care to residents. A multiple case-study analysis of these varying strategies identified three components common to all the strategies: **oral hygiene care, dental treatment and regular oral assessment**. Confusion was evident concerning responsibility for various levels of residents' oral health. Thus, the authors reiterated the need for delineation of responsibility for each of these three key components. The study examined the complexities influencing oral hygiene care provision: 'oral hygiene may be the most effective way to maintain oral health in this population but the conflicting priorities we heard indicate that it is difficult to sustain

in a population with severe disabilities' (Thorne et al. 2001) and high levels of cognitive impairment. This research concluded that 'the solution to high-quality oral health services in long-term care facilities may be considerably more complex than simply providing on-site services, routines, and resources', and that 'attention is needed to the individual facility organisational culture, philosophical values and communication patterns' (Thorne et al. 2001). Participants agreed that 'crisis management was an inefficient and ineffective way in which to organise a service'. Participation of dental personnel at residents' care planning conferences was reported as being central to a successful dental service: 'A more prominent role for dental personnel on the health-care team of the facility probably offers the greatest likelihood of improving oral health through increased visibility, active participation, and regular evaluation of results'. A 'regular system of oral assessments for all residents' was favoured; such a system required 'an explicit, systematic, and routinised assessment plan' (Thorne et al. 2001).

The importance of maintaining residents' oral health was reflected in questionnaire responses in the Adelaide Dental Study of Nursing Homes, in which both dentists and directors of nursing reported the need for regular dental assessments for residents (Chalmers et al. 2001). The need to monitor residents' oral health is also reflected in the Australian Commonwealth Residential Care Standard 2.15 Oral and Dental Care, which requires that residents' oral health must be maintained. Indeed, in 2003 the Australian Government Department of Health and Ageing conducted a national residential care documentation trial using three dental tools that were well received by the participating facilities (Australian Government Department of Health and Ageing 2004). Within the Australian residential aged care community, better integration of carers into oral hygiene care delivery and the timely identification of oral health problems are essential in improving residents' access to and equity in oral health (MacEntee et al. 1999).

1.2 Assessment of residents' oral health

A recent systematic review of oral hygiene care for adults with dementia in residential aged care facilities discussed a variety of issues concerning the assessment of residents' oral health (Pearson & Chalmers 2004; NHMRC 1995). Such assessment of oral health generally relies on a person's ability to self-report their dental symptoms and remain cooperative and communicative throughout an oral inspection (Kayser-Jones et al. 1995). However, when assessing older adults with dementia, self-reporting, cooperation and communication cannot be consistently relied upon due to the nature of dementia and associated symptomatology. Therefore, it is essential for carers of adults with dementia to be involved in the assessment and ongoing review of their oral health.

A historical review of nursing textbooks highlighted the advocacy since the 1800s for 'teeth cleaning … at least once daily', but no specific importance was attached to assessment of the mouth until the 1990s (Turner & Lawler 1999). It is necessary to delineate between a comprehensive dental examination conducted by a qualified dentist and a dental assessment screening by a carer, nurse, allied health professional or medical practitioner. A comprehensive dental examination conducted by a qualified dentist involves the visual and tactile examination of all oral structures and hard and soft tissues using specific extraoral and intraoral light sources and dental equipment

(e.g. a mouth mirror), and using approved infection control procedures. A dental assessment screening by a carer, nurse, allied health professional or medical practitioner advocates the use of approved infection control procedures such as gloves and hand washing, and the use of an extraoral light source (e.g. natural light, flashlight), but usually does not include the use of any intraoral light sources or specific dental equipment. A basic level of training or indeed no training may be advocated for individual oral assessment screenings. Further clarification concerning dental examinations can be obtained from state dental boards (Pearson & Chalmers 2004).

In the ideal situation, all residents would have a dental examination by a dentist upon admission to a facility (or shortly thereafter), and at regular intervals afterwards. Best practice has indicated that these examinations should be supplemented with oral health assessments and screenings by trained nurses and carers. Indeed, there may be situations in which there are no dentists located in the area (especially some rural areas), there is no dentist that can provide dental examinations at the facility on a regular basis, or residents cannot afford to pay for a dental examination by a dentist.

Social, political and health care policies and practices differ across states and countries, and will dictate who can provide residents' dental examinations and assessments at various intervals. Nurses and carers are able to successfully complete oral assessments; however, the comprehensiveness of the assessment may vary depending on the level of training they have received (Kayser-Jones et al. 1996; Kayser-Jones & Schell 1995). Oral health assessments and screenings can also be conducted by trained nurses and carers, as appropriate, to monitor residents' oral health, evaluate oral hygiene care interventions, initiate a dental visit when required, assist with residents' individual oral hygiene care planning (this is especially important when attendance of dental professionals to the facility is limited or costly), and triage and prioritise residents' dental needs. Nurses have been validated by dentists as being able to accurately count teeth present in the mouths of older women (Warren et al. 1999). Carers with more limited training and education have successfully performed oral assessment screenings for residents with dementia (Kayser-Jones et al. 1996; Kayser-Jones & Schell 1995; Lin et al. 1999). For example, in the US a national oral assessment, the Minimum Data Set (MDS), is required when residents are admitted to a facility. Although varying reports have been published concerning the utility and compliance with this national assessment, it was developed to be completed by nurses (Blank et al. 1996; Thai et al. 1997).

Currently, there is no 'gold standard' of oral health for institutionalised older adults in residential care. However, it is agreed that there is a need for clinical evidence-based tools to assist with the collection of information concerning oral disorders and dental treatment needs in older adults (MacEntee & Wyatt 1999).

Burke and Wilson (1995) have suggested that an index of oral health should satisfy many criteria were it to be:

- reproducible, reliable and of proven validity
- simple, quick to determine and involve only a minimum of dental equipment
- computer compatible and appropriate for use with data systems
- affordable for intended purposes
- capable of being recorded easily without chair-side assistance.

Several of these oral health indices have been developed and used in geriatric and hospitalised populations by dentists and dental hygienists, but few have been developed specifically for use by nurses and/or carers in residential care. The Geriatric Oral Health Assessment Index (GOHAI) is a useful instrument for assessing quality-of-life influences and oral health, but it is based on self-reporting and is difficult to use with institutionalised older adults with communication problems and cognitive impairment (Locker 2003; Atchison & Dolan 1990; Calabrese et al. 1999). Other indices such as the Oral Health Index (OHI) and the Clinical Oral Disorder in Elders Index (CODE), which are based on comprehensive assessments by dentists and dental hygienists, are not suitable for use by non-dental professionals (MacEntee & Wyatt 1999; Burke & Wilson 1995). Several reliable and valid oral assessment tools have been developed for use by nurses and dental hygienists in hospitals and other settings such as intensive care and chemotherapy/cancer units; indeed, several literature/research reviews of these have been completed (Anderson et al. 1999; Eilers et al. 1988, Evans 2001, Dickinson et al. 2001, Fitch et al. 1999, Fitzpatrick 2000, Holmes 1993, Roberts 2000a, 2000b, 2000c). However, their focus is mainly on intubated patients, swallowing problems and oral mucosal conditions such as mucositis, candidiasis and xerostomia that are commonly found in these specific groups of hospital patients. Indeed, in one study Cohen's Kappa statistics for categories ranged widely from 0.2–0.3 for lips, teeth and dentures, to 0.5–0.7 for gums, voice and swallowing, and 0.8 for saliva (Andersson et al. 1999). The studies with high intra- and inter-examiner reliabilities required comprehensive, long-term training for their reliable use, and weighting of the Kappa statistic was necessary to achieve this high level of reliability, with little explanation of any weighting rationale (Dickinson et al. 2001). Several nursing texts have described general oral assessment procedures for hospitalised patients, but these were not presented as actual useful tools (Walton et al. 2001). Validated and reliable acute care oral assessment tools need to be clearly delineated in the literature from the 50+ articles detailing and reviewing oral hygiene care protocols (Pearson & Chalmers 2004).

Research has been conducted on providing educational programs for carers working in residential care facilities, but it has not specifically addressed the assessment of residents' oral health status by the carers (King 1992; Paulsson et al. 1998). Oral assessment tools for use in residential care facilities have been published, but hardly any have been validated or had their reliability adequately assessed (Shaw 1998). The only published, comprehensive, oral health assessment tool developed specifically for use by carers in residential care facilities, including for residents with dementia, is the Brief Oral Health Status Examination (BOHSE) (Appendix A) (Kayser-Jones et al. 1995). The BOHSE was initially trialled on a group of 100 residents with moderately severe cognitive impairment and was later repeated with a group of 68 residents with high cognitive impairment (Kayser-Jones et al. 1995; Lin et al. 1999). In the initial BOHSE trial the examiners all used gloves, gauze, a tongue blade and a hand-held light source.

The examiners used in the initial trial were a variety of dentists, registered nurses (RNs), licensed vocational nurses (LVNs), certified nursing assistants (CNAs) (which equate to registered nurses), enrolled nurses and personal care attendants in the Australian residential care setting. Interestingly, the study was not planned to include CNAs but the protocol was changed to include them 'recognising the scarcity of licensed staff in nursing homes and knowing that most of the hands-on care (including oral hygiene) is given by the CNAs' (Kayser-Jones et al. 1995). All received a training course in the use of the BOHSE. Mean BOHSE scores ranged from 3.75 for CNAs to

3.9 for dentists and 5.06 for RNs. The highest significant correlation coefficients for the BOHSE total score were 0.63 for dentists and RNs and 0.68 for LVNs, and ranged from 0.40 to 0.65. For individual BOHSE categories, percentage agreement and Cohen's Kappa statistic were used. Percentage agreement ranged from 50.5% for oral cleanliness between dentists and LVNs to 98% for lymph nodes between dentists and RNs. Not all categories had a significant inter-examiner Kappa statistic and several were negative. Inter-examiner Kappa statistics were generally less than 0.30 for lymph nodes, lips, tongue, tissues, saliva, and oral cleanliness; in the range 0.4–0.7 for gums, natural teeth and artificial teeth; and approximately 0.8 for pairs of teeth in chewing position. The intra-examiner correlation coefficients for BOHSE total score ranged from 0.79 for CNAs to 0.88 for RNs, including dentist coefficient of 0.83. Mean time taken to complete the BOHSE examination was 5.6 minutes for dentists, 7.4 minutes for RNs, 7.9 minutes for LVNs and 8.7 minutes for CNAs.

In the study by Lin et al. (1999), using the BOHSE on an even more severely cognitively impaired population, Spearman correlation coefficients for total score were slightly lower than in the initial study , ranging from 0.35 to 0.58 between dentists, nurses and CNAs. Inter-examiner percentage agreements ranged in a pattern similar to that in the original Kayser-Jones study. However, inter-examiner Kappa statistics were much lower, with many being negative and most in the range 0.1–0.3; the highest Kappa of 0.5 was for pairs of teeth in chewing position. No intra-examiner statistics were presented by Lin et al. (1999), and they concluded that additional training did not improve inter-examiner agreement, with the most difficult categories being the lips, gums, natural teeth and oral cleanliness. Further trialling using a modified BOHSE was conducted nationally during 2003 in the Australian institutional setting with the Australian Government Department of Health and Ageing (2004). The BOHSE was modified to simplify the categories and their content, such that the assessment was then considered a screening that was able to be conducted by a range of residential care staff from RNs to personal care attendants.

Another recently published index that may be helpful with older adults who are more independent is the Index of Activities of Daily Oral Hygiene (ADOH) (Bauer 2001). This index is reportedly useful for monitoring progressive loss of physical oral self-care ability, as well as measuring rehabilitative improvements in physical oral care function. If only oral mucosal and plaque indices are required, a useful tool for use by carers may be the Mucosal Plaque Score (MPS) Index, which has been trialled with dental and nursing professionals (Henriksen et al. 1999). Further research is required to validate the use of these tools on residents by varying types of dental professionals, medical and nursing professionals, and carers/staff working in residential care.

There was evidence from the systematic review that the literature supported the need for a variety of oral assessment tools to be used by a range of carers and health care providers in different acute care and long-term care settings (e.g. intensive care units, cancer treatment units, residential aged care facilities). Since publication of this (English language) systematic review, a similar review of 'assessment scales for nursing assessment of the mouth' has been published in German (Gottschalck et al. 2003), reporting on '40 assessment methods and instruments'. The German review's findings concerning 'geriatric assessment methods' in residential care, in particular that differing assessment methods/tools are needed in different settings, concurred with those of the English language systematic review (Pearson & Chalmers 2004).

1.3 Study hypothesis, aims, outcomes and significance

This study investigated the role of carers in Australian residential care facilities in maintaining adequate oral health for residents and improving their timely referral and access to dental professionals. Three aspects of best practice were used in this research. The first was to assist participating facilities to develop comprehensive and appropriate oral and dental care policies and procedures in accordance with Commonwealth Residential Aged Care Standards. The second was to train carers to use an Oral Health Assessment Tool (OHAT), and then assess the reliability and validity of the carers' use of the tool in assessment and monitoring of residents' oral health. The OHAT in this project is a modified version of the BOHSE (Kayser-Jones et al. 1995). The third was to use an Oral Hygiene Care Plan (OHCP) developed as part of an evidence-based oral health protocol for carers of dependent older adults (Blanco & Chalmers 2001).

This project will make a significant contribution not only to Australian, but also international, geriatric dental research. It will assist with the ongoing development of the BOHSE instrument for use by carers in residential care, especially with the many residents who have dementia. It will help carers detect dental pain earlier in residents with dementia, many of whom have severe communication difficulties and behavioural problems that previously made this task a challenge. The project will provide an oral health model that includes oral and dental policies and procedures, a reliable tool for the assessment of oral health by carers, and a comprehensive and individualised OHCP for residents. The collection and provision of such information will contribute to improving access to dental care for residents, improving the early assessment and detection of residents' dental problems, improving oral hygiene care provision for residents and increasing the prominence of oral health within the residential care community.

Hypothesis

The use of oral and dental policies and procedures, an Oral Health Assessment Tool (OHAT) and an Oral Hygiene Care Plan (OHCP) will improve carers' involvement in maintenance of residents' oral health and the delivery of oral hygiene care to residents in Australian residential care facilities.

Aims

1. To establish best practice oral health policies and procedures for participating residential care facilities in accordance with the Commonwealth Residential Aged Care Oral and Dental Standard 2.15

2. To trial, over a 6-month period, the use by carers of an Oral Health Assessment Tool in randomly selected Australian residential care facilities in conjunction with residents' 3-monthly care plan reviews

3. To trial, over a 6-month period, the use by carers of an Oral Hygiene Care Plan in Australian residential care facilities, in conjunction with residents' 3-monthly care plan reviews

4. To test the reliability and validity of the use by carers of the Oral Health Assessment Tool over a 6-month period in Australian residential care facilities.

Expected outcomes

1. Oral health policies and procedures will be available for use in Australian residential care facilities, in accordance with the Commonwealth Residential Aged Care Oral and Dental Standard 2.15 and associated guidelines.

2. Carers' involvement in maintenance of residents' oral health will be improved by the use of the OHAT.

3. Carers' involvement in the delivery of residents' oral hygiene care will be improved by the use of the OHCP.

4. The OHAT will be a reliable and valid tool for use in Australian residential care facilities.

2 Methods

2.1 Study design, sampling and ethical implications

This research was implemented in three Australian States: New South Wales (NSW), Victoria (Vic), and South Australia (SA), with a key geriatric dental researcher coordinating the data collection in each state. From the available list of accreditation assessments for Commonwealth-funded residential aged care facilities in each of these states (Australian Government Department of Health and Ageing), a convenience sample of the 50 highest-ranked facilities in each state was randomly selected and 23 individual facilities were approached to participate (SA—3 urban and 3 rural; NSW—3 urban and 4 rural; Vic—6 urban and 4 rural). The number of facilities was able to be increased from 18 to 23 due to additional funding availability. In each state, both urban and rural facilities were selected. No facilities refused to participate at the start of the project. However, two urban facilities in NSW did not continue participation after baseline data collection, and their data have not been included in analyses for this study. This totalled 21 residential care facilities in the three states that completed the project. Approval was obtained from the appropriate administrators/directors of nursing at each residential care facility and, where required, by the Human Research Ethics Committee for affiliated Regional Health Organisations. The need to have several affiliated Regional Health Organisations approve the project resulted in a longer timeline than was originally anticipated before commencement of the study. All residents living at each facility at baseline were offered participation in the project. All appropriate persons/guardians were contacted by telephone and mail to obtain written consent to participate. The follow-up procedures to obtain consent were as used in The Adelaide Dental Study of Nursing Homes, and included a mailing followed, where required, by an in-person or telephone conversation (Chalmers et al. 2002).

2.2 Methods (piloting, timeline, measurement, data collection, evaluation)

Piloting for this research commenced in 2001 in three residential care facilities in Adelaide, South Australia. This pilot research included the development of best practice oral health policies and procedures for residential care facilities in accordance with the Commonwealth Residential Aged Care Oral and Dental Standard 2.15. These policies and procedures used information from an international evidence-based oral hygiene care protocol for dependent older adults and Australian oral health promotion material such as the 'Alzheimer's Association South Australian Dental Group Resource Handbook' for carers (Blanco & Chalmers 2001; Chalmers et al. 1997). This information was disseminated to all liaison persons, and best practice oral health policies and procedures were then able to be established individually by each participating residential care facility, with input from the investigators where requested. A liaison person (a more senior/long-term staff member) from each residential care facility was designated to assist with the project (Kayser-Jones et al. 1995; Lin et al. 1999), and their participation was supported by a financial contribution made by the project to each

facility. The liaison person helped to obtain the following details from participating residents' care plans and medical records—date of birth, sex, date of admission to the facility, general medical conditions and any diagnosed dementia (as per the questionnaire used in The Adelaide Dental Study of Nursing Homes) (Chalmers et al. 2002). Each liaison person was given a study protocol and a log sheet to monitor the collection of data during the study. The great majority of staff participating in the study were personal care attendants, with some registered nurses, enrolled nurses and nurse assistants also participating.

The Brief Oral Health Status Examination (BOHSE) was originally developed in the United States by Kayser-Jones et al. and has been trialled in US residential care facilities, including populations of residents with dementia (see Appendix A) (Kayser-Jones et al. 1995; Lin et al. 1999). For this project the BOHSE tool was modified for practical use by a more diverse range of carers in Australian residential care facilities, to account for the high levels of residents with dementia and their related behavioural problems (Blanco & Chalmers 2001). Feedback from residential care staff in the piloting stage of this study indicated that they felt the BOHSE was too complicated and took too long to complete. The original BOHSE tool has 10 categories for the assessment of residents' lymph nodes, lips, tongue, tissues, gums, saliva, natural teeth, pairs of teeth in chewing position, dentures and oral cleanliness. In this project the BOHSE was modified by eliminating the categories for lymph nodes and pairs of teeth in chewing position; combining the tissue and gum categories; and adding a category for the assessment of behavioural problems and pain related to oral and dental problems, and a trigger for referral to a dentist. Thus, the Oral Health Assessment Tool (OHAT) used eight categories. A score of 0=healthy, 1=oral changes, or 2=unhealthy was given in each of the assessment categories, and a score over the eight categories was calculated. The liaison person helped with the selection of carers to assist with administration of the OHAT) (see Appendix B) and the Oral Hygiene Care Plan (OHCP) (see Appendix C) for each participating resident. This tool was used by carers for all residents in each facility at baseline and at the following regular intervals: baseline, 3 months and 6 months. Ideally these were aligned with 3-monthly resident care plan reviews that are routinely conducted in residential care facilities. Residents were usually examined on a chair or bed in their rooms. Carers were advised to work either alone or in a team with one or more other carers.

The OHCP was developed using recommendations from the Australian Commonwealth Residential Aged Care Dental Standard 2.15, in addition to evidence-based resources such as the Alzheimer's Association South Australian Dental Group Resource Handbook. It had a special focus on the behavioural and psychological problems of residents (Blanco & Chalmers 2001; Fleiss et al. 1980). After evaluation of each resident's oral health using the OHAT, carers developed and updated an OHCP for each resident.

Pads of 50 coloured duplicate OHCP forms (white/pink) or OHAT forms (white/blue) were distributed to liaison persons. The top white form was returned upon completion to the researchers, while the coloured duplicate form was retained by the nursing facility to be placed in the resident's record. Previous studies using the BOHSE indicated the need to ensure that carers be carefully selected and be long-term staff members of the facility (Kayser-Jones et al. 1995; Lin et al. 1999). The numbers of carers selected varied according to the number of residents participating at each facility and the enthusiasm of the facility. Indeed, some facilities requested that all their staff

participate and conduct OHATs and OHCPs. At the baseline focus group, a 3-hour training program was completed with the selected carers at each facility in accordance with the previous use of the BOHSE instrument (Kayser-Jones et al. 1995; Lin et al. 1999). This baseline focus group included a calibration session for the carers using the OHAT. At the completion of the project comprehensive practical oral hygiene care training was offered to all staff of all facilities.

Prior to commencement of the baseline data collection, a chief investigator completed a questionnaire with each facility to assess their involvement in several dental issues (see Appendix D). The 12 questions were rated using a 4-point Likert scale and the maximum score attainable was 36. They included an assessment of: written oral and dental policies and procedures; any continuing education courses; public and private dental contact; completion of oral assessments by staff and dentists at residents' admission and at regular intervals; completion of an oral hygiene care plan; and any other additional initiatives. This questionnaire was again completed at the end of the project.

To evaluate the appropriateness and effectiveness of the OHCP and the OHAT, qualitative focus group techniques were used with carers, and discussions were conducted at each residential care facility at baseline, 3 months and 6 months. Key questions used to facilitate discussions included:

- What priority do oral health and dental issues have in this facility?
- What oral hygiene care problems do you have with residents, especially residents with dementia?
- Do you think residents should have regular dental assessments by staff and dentists?
- How could residents' oral health be improved?
- What educational initiatives would help you to better provide oral hygiene care?

At 3 months and at 6 months a questionnaire was also given to carers at the focus groups concerning their use of the OHAT and OHCP. The questionnaire contained 21 questions (12 for the OHAT and 9 for the OHCP) with a 4-point Likert response scale from strongly disagree to strongly agree (Blanco & Chalmers 2001). Another question estimated the average time taken to complete the OHAT and the OHCP. Two open-ended questions also asked for comments concerning any problems encountered with the OHAT or the OHCP.

Reliability assessments of the tool were made using duplicate administration of the OHAT by the carers on randomly selected residents at each of the facilities at 3 months. Reliability was assessed as per the BOHSE procedures (Kayser-Jones et al. 1995). Pads of 50 coloured duplicate OHCP-reliability forms (white/yellow) were distributed to liaison persons. The top white form was returned upon completion to the researchers, while the coloured duplicate form was retained by the nursing facility to be placed in the resident's record. Intra-examiner reliability was assessed by the carer re-examining a group of the same residents again. Inter-examiner reliability was assessed by ensuring that each resident was examined by a second carer. In each case, duplicate administration of the tool was made within 48 hours of the original assessment.

Content and face validity of the original BOHSE items and its subsequent usefulness in another institutionalised population of older adults with dementia reflected a high level of content validity (Kayser-Jones et al. 1995; Lin et al. 1999). The content validity of both the modified BOHSE, termed OHAT in this study, and the OHCP were developed by a systematic review of the literature concerning oral assessment tools, and by consultation during the piloting stage with numerous peers in geriatric dentistry, dementia care and residential aged care, including dentists, registered nurses, directors of nursing, dental hygienists and personal care attendants in both Australia and the United States (Blanco & Chalmers 2001; Pearson & Chalmers 2004). Suggestions and comments by these peers were reviewed and incorporated into the final OHAT and OHCP. Concurrent validity assessment of the OHAT was conducted by Dr Chalmers, who completed dental examinations on 21 participants to assess dental pain and behavioural problems, oral mucosal lesions, denture status, tooth status and plaque accumulation using standardised assessments and indices (see data analysis section).

Timeline

This research was conducted using 3-monthly reviews (total = 3 reviews including baseline) over a 6-month time period. A 6-month planning and preparation time period was required to ensure that all required submissions to regional Human Research Ethics Review Committees were made.

Data analysis

Data management and analysis was completed using SPSS Version 12.0. Descriptive statistics were used to quantify: carers' questionnaire results from the focus groups; the scores (both total and for individual components) from the administration of the OHAT; errors/incomplete components of the OHAT and OHCP; and responses on the OHCPs. Analysis investigated the changes in residents' OHAT scores over the 6-month period in each category and in total. OHAT scores were also investigated by state and urban versus rural location. Qualitative review was undertaken of written comments on the carers' questionnaires as well as of transcripts of focus groups discussions, in which recurrent themes were identified.

Reliability assessments for the stability of the OHAT were made using duplicate administration of the tool by the carers on randomly selected residents at each facility at 3 months. The stability of the tool was assessed in a test–retest of residents using percentage agreements and Cohen's Kappa statistics for the individual categories and intra-class correlation statistical techniques for the total score (Fleiss et al. 1980; Kahn & Sempos 1989). The Kappa statistic indicated the degree of departure between the actual observed percentage agreement and chance agreement, and was not weighted. Intra-examiner reliability was assessed by the carer re-examining the same residents again, and inter-examiner reliability was assessed by ensuring that each resident was examined by a second carer. These reliability analyses were determined for both the total score and the individual components of the tool. In interpretation of the Kappa statistic, values under 0.00 were considered poor, 0.20 slight, 0.21–0.40 fair, 0.41–0.60 moderate, 0.61–0.80 substantial and 0.81–1.0 almost perfect agreement (Landis & Koch 1977).

Validation of the OHAT was undertaken by comparing the results of a visual and tactile dental examination of 21 residents using standard criteria by a qualified dentist to the OHAT category responses. The oral cleanliness category was compared with the Plaque Index (this was also extended to dentures) (Silness & Loe 1964); saliva category with a clinical evaluation of xerostomia; the lips, tongue, gums and tissues categories with the presence of oral lesions (WHO 1987); the dentures category with denture assessment (Rise 1979); the natural teeth category with tooth status (NIDR 1987); and the dental pain/behaviour category with self-reported pain and a list of problems with oral hygiene care from The Adelaide Dental Study of Nursing Homes (Chalmers et al. 2002). Percentage agreement and Pearson correlation were analysed for each comparison using a significance level of $p<0.05$.

3 Results

3.1 Participation

The numbers of residents participating from the 21 facilities during the study period are presented in Table 1 (note that the data from the two facilities that commenced at baseline but then withdrew from the study are not included in this table). Of the 534 residents who participated at baseline, 455 completed the three study phases. Thus, a complete data set was collected for these 455 residents comprising OHATs at baseline, 3 months and 6 months; two OHAT reliability exams at 3 months; and OHCPs at baseline, 3 months and 6 months. Sixty-five residents deceased during the study period—32 at 3 months and another 33 at 6 months. Fourteen residents who participated at baseline and through to the completion of the study did not have a complete data set and were excluded from analysis.

Table 1: Participation of residents from the 21 facilities during the study period[(a)]

Baseline residents participating	Residents with complete data (not including deceased)	Residents with incomplete data (not including deceased)	Residents with incomplete data as deceased 3 months	Residents with incomplete data as deceased 6 months (not including 3 months)	Residents deceased during study period total
534	455	14	32	33	65

(a) This table does not include residents from the two facilities who commenced baseline participation but then withdrew from the study.

The characteristics of deceased participants and those who had complete data are presented in Table 2 (note that age and time since admitted could not be analysed because of incomplete data). There were no significant differences between deceased participants and those who completed the study for having a diagnosed dementia or RCS score, or for type of consent needed. However, the deceased participants did have a significantly higher mean baseline OHAT score.

Table 2: Characteristics of deceased participants and those who had complete data

Characteristic	Deceased participants (n=65)	Participants with complete data (n=455)
Diagnosed dementia (per cent)		
Yes	49.2	56.5
No	50.8	43.5
RCS score (per cent)		
1–4	86.0	88.9
5–8	14.0	11.1
Consent (per cent)		
Self	40.0	40.7
Guardian	56.9	59.1
Mean baseline OHAT score*	**3.65**	**2.71**

Notes

Not sig. p>0.05, chi-square test.

* Sig. p<0.05 t-test.

Facility questionnaire (baseline and 6 months)

Results from the facility questionnaires conducted at baseline and 6 months are presented in Table 3. All 21 facilities that completed the study increased their facility questionnaire scores. Ten participating facilities described ongoing implementation of the OHAT and OHCP assessments in their facility, and greatly increased awareness of oral health issues and interaction with public and private dentists. Two reported the regular attendance of not only a dentist but also a dental hygienist at the facility.

Table 3: Facility questionnaire scores at baseline (B) and 6 months

	Residential aged care facility																			
	1		2		3		4		5		6		7		8		9		10	
Question	**B**	**6**	**B**	**6**	**B**	**6**	**B**	**6**	**B**	**6**	**B**	**6**	**B**	**6**	**B**	**6**	**B**	**6**	**B**	**6**
1. Are there written oral and dental policies and procedures for the facility?	3	3	3	3	2	3	2	3	2	3	2	3	1	2	1	3	2	3	2	2
2. Was continuing education (CE) in oral health held in prior 12 months?	2	3	1	2	0	1	0	2	2	2	0	2	0	0	0	3	0	3	0	3
3. What was the CE format?	3	3	3	3	0	2	0	2	2	3	0	2	0	0	0	3	0	3	0	3
4. Is there a contact list of public dentists/clinics?	3	3	3	3	2	3	1	2	2	2	2	2	3	3	3	3	2	3	2	2
5. Is there a contact list of private dentists?	3	3	3	3	2	3	2	2	2	2	2	3	3	3	3	3	2	3	1	2
6. Are oral assessments completed for new residents by staff?	3	3	3	3	0	3	2	3	0	3	1	3	2	2	2	3	2	3	3	3
7. Are oral assessments completed for new residents by a dentist?	2	2	2	2	0	2	0	2	0	2	0	2	0	2	0	3	0	3	0	2
8. Do staff complete oral assessments regularly/annually for residents?	3	3	3	3	0	3	0	3	0	3	1	3	2	2	2	3	2	3	3	3
9. Do dentists complete oral assessments regularly/annually for residents?	2	2	2	2	0	2	0	2	0	2	0	2	0	2	0	3	0	3	0	2
10. Is there an oral hygiene care plan in each resident's record?	2	3	3	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	2	2
11. Is there a place in residents' records to list their dentist?	3	3	3	3	2	3	2	3	2	3	2	3	2	2	2	3	2	3	2	2
12. Are there oral health initiatives *in addition to the dental standard requirements* in the facility?	2	3	3	3	0	3	0	3	0	3	1	3	1	2	1	3	0	3	2	2
Total score (out of 36)	**32**	**34**	**32**	**33**	**10**	**31**	**11**	**30**	**14**	**31**	**13**	**31**	**16**	**22**	**17**	**36**	**14**	**36**	**17**	**28**

(continued)

Table 3: Facility questionnaire scores at baseline (B) and 6 months (continued)

	Residential aged care facility																					
	11		12		13		14		15		16		17		20		21		22		23	
Question	**B**	**6**	**B**	**6**	**B**	**6**	**B**	**6**	**B**	**6**	**B**	**6**	**B**	**6**	**B**	**6**	**B**	**6**	**B**	**6**	**B**	**6**
13. Are there written oral and dental policies and procedures for the facility?	3	3	2	3	2	2	2	3	2	2	2	3	0	1	2	2	1	2	2	3	2	2
14. Was continuing education (CE) in oral health held in prior 12 months?	1	2	1	1	0	0	0	3	0	0	0	1	0	1	1	3	1	2	0	3	0	1
15. What was the CE format?	1	2	1	2	0	0	0	3	0	0	0	1	0	1	1	3	1	2	0	3	0	1
16. Is there a contact list of public dentists/clinics?	3	3	1	2	2	2	2	3	2	2	2	3	2	2	2	2	2	2	2	3	2	2
17. Is there a contact list of private dentists?	3	3	0	2	2	2	2	3	2	2	2	3	0	0	1	2	2	2	0	3	2	2
18. Are oral assessments completed for new residents by staff?	3	3	2	3	3	3	2	3	3	3	2	2	0	1	0	1	0	1	2	3	1	1
19. Are oral assessments completed for new residents by a dentist?	2	2	0	2	0	2	0	2	0	2	0	2	0	0	0	1	0	1	0	2	2	2
20. Do staff complete oral assessments regularly/annually for residents?	2	3	1	3	2	3	2	3	3	3	0	2	0	1	0	1	0	1	1	3	0	1
21. Do dentists complete oral assessments regularly/annually for residents?	2	2	0	2	0	2	0	2	0	2	0	2	3	0	0	1	0	1	0	2	0	1
22. Is there an oral hygiene care plan in each resident's record?	2	2	2	2	2	2	1	3	3	3	1	2	0	0	0	1	0	1	2	3	1	1
23. Is there a place in residents' records to list their dentist?	2	2	2	2	2	2	0	3	2	2	0	2	0	0	2	2	2	2	2	2	0	1
24. Are there oral health initiatives *in addition to the dental standard requirements* in the facility?	3	3	1	2	0	1	1	2	2	2	0	2	2	2	1	1	0	1	1	3	0	1
Total score (out of 36)	**27**	**30**	**13**	**26**	**15**	**21**	**12**	**33**	**19**	**21**	**9**	**25**	**7**	**9**	**10**	**20**	**9**	**18**	**12**	**33**	**10**	**16**

Resident characteristics

The percentage distribution of residents' characteristics by location is presented in Table 4. Mean age of the 455 participating residents was 82.1 years. Urban residents were significantly younger, had a longer time since admission, and were more cognitively impaired. Urban and rural residents had similar RCS scores and consent characteristics.

Table 4: Residents' characteristics by location (per cent)

	Urban RACFs (n=202)	Rural RACFs (n=253)	All RACFs (n=455)
Age			
<75 years	25.2*	14.5	19.3
75–84 years	37.6	37.9	37.8
85+ years	37.1	47.6	42.9
Time since admission			
<12 months	24.3*	36.9	31.3
12+ months	75.7	63.1	68.7
Diagnosed dementia			
Yes	67.8*	47.4	56.5
No	32.2	51.4	43.5
Resident Classification Scale			
1–4	91.5	86.8	88.9
5–8	8.5	13.2	11.1
Consent			
Self	35.6	44.7	40.9
Guardian	64.4	54.9	59.1

* Sig. p<0.01 chi-square test.

Oral Health Assessment Tool

Baseline

The OHAT score distribution for individual categories and in total for the 455 participants is presented in Table 5. The first four categories followed similar distributions, with approximately three-quarters or more of residents scoring '0' and the majority of the remaining scoring '1'. Thus, small percentages of residents scored '2' for the categories of lips, tongue, gums and tissues and saliva. Scores were distributed quite differently for the categories of natural teeth, dentures and oral cleanliness, with approximately half of the residents scoring '0', another one-quarter to one-third scoring '1' and over 14% scoring '2'. For the dental pain category, 91% of residents scored '0'. Although higher percentages of residents scored '2' for at least one category, only 7.3% were referred to a dentist.

Table 5: Baseline OHAT score distribution (n=455) (per cent)

	Score		
Category	**0**	**1**	**2**
Lips	71.6	28.1	0.2
Tongue	74.7	23.3	2.0
Gums and tissues	76.0	19.1	4.8
Saliva	86.8	11.9	0.2
Natural teeth (n=305)	50.5	27.2	22.3
Dentures (n=373)	58.7	25.7	15.5
Oral cleanliness	48.8	36.9	14.3
Dental pain	90.8	4.8	4.4

The baseline distribution of total OHAT scores for the 455 residents is presented in Table 6. Few residents scored 6 or more in total (11.6%), with the majority of the remainder scoring 3 or less (70.6%). Several residents scored more than 9 out of 16 (3.0%).

Table 6: Baseline distribution of total OHAT scores (n=455) (per cent)

OHAT scores													
0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
16.7	18.7	21.1	14.1	9.9	7.9	4.0	2.4	2.2	1.1	1.5	0.2	0.0	0.2

Mean baseline OHAT category and total scores by state and location for the 455 residents are presented in Table 7. Mean category scores were in the range 0.1–0.3 for the categories of lips, tongue, gums and tissues, saliva and dental pain. The highest mean scores were for natural teeth, followed by dentures and oral cleanliness. The mean total score for all residents was 2.71 out of a possible highest score of 16. When the mean scores were analysed by state, there were significant differences—mainly between South Australia and one or both of the two other states for several of the categories; and also for overall score, where South Australian scores were lower than for the other states. When the mean scores were analysed by location (urban/rural), there were significant differences for several categories, with rural scores generally lower. There was no significant difference in total score between urban and rural locations.

Table 7: Mean baseline OHAT category and total scores by state and location (n=455)

	State			Location		
Category	**SA (n=166)**	**Vic (n=148)**	**NSW (n=141)**	**Urban (n=202)**	**Rural (n=253)**	**All (n=455)**
Lips	0.26	0.30	0.30	0.29	0.28	0.29
Tongue	0.16[(b)]	0.32	0.36	0.20*	0.33	0.27
Gums and tissues	0.20[(a)]	0.32	0.35	0.35**	0.24	0.29
Saliva	0.12	0.14	0.23	0.16	0.16	0.16
Natural teeth (n=305)	0.43[(a)] (n=107)	0.99 (n=85)	0.79 (n=113)	0.85** (n=117)	0.63 (n=188)	0.72
Dentures (n=373)	0.57 (n=142)	0.48 (n=108)	0.64 (n=123)	0.56 (n=154)	0.57 (n=219)	0.57
Oral cleanliness	0.59	0.63	0.76	0.59	0.71	0.65
Dental pain	0.07[(a)]	0.15	0.20	0.19**	0.09	0.14
Total score	**2.16[(c)]**	**2.75**	**3.31**	**2.67**	**2.74**	**2.71**

* p<0.01 t-test.
** p<0.05 t-test.
(a) p<0.05 ANOVA.
(b) p<0.01 ANOVA – Scheffe test SA different to Vic and NSW.
(c) p<0.01 ANOVA – Scheffe test SA different to NSW.

Three months

The 3-month OHAT score distribution for individual categories and in total for the 455 participants is presented in Table 8. The first three categories followed similar distributions, with approximately three-quarters or more of residents scoring '0' and the majority of the remaining scoring '1'. Thus, small percentages of residents scored '2' for the categories of lips, tongue, and gums and tissues. Scores were again distributed quite differently for the categories of natural teeth, dentures and oral cleanliness, with approximately half or more of the residents scoring '0', another one-quarter to one-third scoring '1' and around 10–20% scoring '2'. Approximately 90% of residents scored '0' for the saliva and dental pain categories. Although higher percentages of residents scored '2' for at least one category, only 3.9% were referred to a dentist.

Table 8: 3-month OHAT score distribution (n=455) (per cent)

	Score		
Category	**0**	**1**	**2**
Lips	70.8	28.6	0.7
Tongue	74.1	24.6	1.3
Gums and tissues	79.8	16.0	4.2
Saliva	86.8	13.0	0.2
Natural teeth (n=311)	53.4	25.4	21.2
Dentures (n=365)	63.0	21.2	15.9
Oral cleanliness	53.0	38.2	8.8
Dental pain	91.4	6.4	2.2

The 3-month distribution of total OHAT scores for the 455 residents is presented in Table 9. Few residents scored 6 or more in total (11.3%), with the majority of the remainder scoring 3 or less (72.4%). Several residents scored more than 9 out of 16 (1.2%).

Table 9: 3-month distribution of total OHAT scores (n=455) (per cent)

OHAT scores													
0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
21.1	16.3	22.9	12.1	10.3	5.9	4.6	4.0	1.5	0.4	0.4	0.4	0.0	0.0

Mean 3-month OHAT category and total scores by state and location for the 455 residents are presented in Table 10. Mean category scores were in the range 0.1–0.3 for the categories of lips, tongue, gums and tissues, saliva and dental pain. The highest mean scores were for natural teeth, followed by dentures and oral cleanliness. The mean total score for all residents was 2.50 out of a possible highest score of 16. When the mean scores were analysed by state, there were significant differences—mainly between South Australia and one or both of the two other states for several of the categories; and also for overall score, where South Australian scores were lower than for the other states. When the mean scores were analysed by location (urban/rural), there were significant differences for several categories, with urban scores generally lower. There was no significant difference in total score between urban and rural locations.

Table 10: Mean 3-month OHAT category and total scores by state and location (n=455)

	State			Location		
Category	**SA (n=166)**	**Vic (n=148)**	**NSW (n=141)**	**Urban (n=202)**	**Rural (n=253)**	**All (n=455)**
Lips	0.22[(a)]	0.33	0.35	0.23*	0.35	0.30
Tongue	0.12[(b)]	0.31	0.41	0.18*	0.34	0.27
Gums and tissues	0.14[(C)]	0.24	0.37	0.25	0.24	0.24
Saliva	0.09	0.14	0.18	0.10	0.16	0.13
Natural teeth (n=311)	0.45[(b)] (n=109)	0.93 (n=86)	0.71 (n=116)	0.72 (n=129)	0.65 (n=182)	0.68
Dentures (n=365)	0.3[(b)] (n=134)	0.66 (n=108)	0.63 (n=123)	0.61* (n=153)	0.47 (n=212)	0.53
Oral cleanliness	0.45[(c)]	0.53	0.72	0.46	0.64	0.56
Dental pain	0.05[(a)]	0.14	0.14	0.13	0.09	0.11
Total score	**1.65[(b)]**	**2.70**	**3.30**	**2.28**	**2.68**	**2.50**

* p<0.01 t-test urban different to rural.
** p<0.05 t-test urban different to rural.
(a) p<0.05 ANOVA.
(b) p<0.01 ANOVA – Scheffe test SA different to Vic and NSW.
(c) p<0.01 ANOVA – Scheffe test SA different to NSW.

Six months

The 6-month OHAT score distribution for individual categories and in total for the 455 participants is presented in Table 11. The first two categories followed similar distributions, with approximately three-quarters of residents scoring '0' and the majority of the remaining scoring '1'. Thus, small percentages of residents scored '2' for the categories of lips and tongue. Scores were again distributed quite differently for the categories of natural teeth, dentures and oral cleanliness, with approximately half or more of the residents scoring '0', another one-fifth to one-third scoring '1' and around 10–20% scoring '2'. Approximately 80–90% of residents scored '0' for the gums and tissues, saliva and dental pain categories. Although higher percentages of residents scored '2' for at least one category, only 4.4% were referred to a dentist.

Table 11: 6-month OHAT score distribution (n=455) (per cent)

	Score		
Category	**0**	**1**	**2**
Lips	72.5	27.5	0.0
Tongue	76.3	22.2	1.5
Gums and tissues	83.3	13.6	3.1
Saliva	87.5	11.6	0.9
Natural teeth (n=327)	56.3	25.7	18.0
Dentures (n=389)	65.3	18.8	15.9
Oral cleanliness	53.6	35.4	11.0
Dental pain	90.5	7.0	2.4

The 6-month distribution of total OHAT scores for the 455 residents is presented in Table 12. Few residents scored 6 or more in total (10.3%), with the majority of the remainder scoring 3 or less (74.3%). Several residents scored more than 9 out of 16 (2.2%).

Table 12: 6-month distribution of total OHAT scores (n=455) (per cent)

OHAT scores													
0	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
20.9	22.6	18.7	12.1	8.4	7.0	4.6	2.2	1.3	0.9	0.7	0.4	0.2	0.0

Mean 6-month OHAT category and total scores by state and location for the 455 residents are presented in Table 13. The mean category scores were in the range of 0.1–0.3 for the categories of lips, tongue, gums and tissues, saliva and dental pain. The highest mean scores were for natural teeth, followed by dentures and oral cleanliness. The mean total score for all residents was 2.40 out of a possible highest score of 16. When the mean scores were analysed by state, there were significant differences—mainly between South Australia and one or both of the two other states for several of the categories, and also for overall score, where South Australian scores were lower than for the other states. When the mean scores were analysed by location (urban/rural), there were significant differences for several categories, with urban scores generally lower, including total score.

Table 13: Mean 6-month OHAT category and total scores by state and location (n=455)

Category	State			Location		All
	SA (n=166)	Vic (n=148)	NSW (n=141)	Urban (n=202)	Rural (n=253)	
Lips	0.16[(a)]	0.36	0.31	0.22**	0.32	0.27
Tongue	0.15[(c)]	0.35	0.27	0.20**	0.30	0.25
Gums and tissues	0.17	0.18	0.26	0.21	0.19	0.20
Saliva	0.14	0.12	0.14	0.11	0.15	0.13
Natural teeth (n=327)	0.45[(c)] (n=108)	0.72 (n=94)	0.68 (n=125)	0.72 (n=121)	0.56 (n=206)	0.62
Dentures (n=389)	0.33[(b)] (n=140)	0.56 (n=117)	0.65 (n=132)	0.49 (n=163)	0.52 (n=226)	0.51
Oral cleanliness	0.50[(b)]	0.53	0.70	0.46*	0.66	0.57
Dental pain	0.07[(b)]	0.10	0.19	0.09	0.14	0.12
Total score	**1.74[(a)]**	**2.54**	**3.04**	**2.11***	**2.64**	**2.40**

* p<0.01 t-test.
** p<0.05 t-test.
(a) p<0.01 ANOVA – Scheffe test SA different to Vic and NSW.
(b) p<0.05 ANOVA – Scheffe test SA different to NSW.
(c) p<0.05 ANOVA – Scheffe test SA different to Vic.

The percentage distribution of OHAT total scores over the study period for all residents is presented in Table 14. There were no significant differences in this percentage distribution at the three data collection times during the study period.

Table 14: Percentage distribution of OHAT total scores over study period for all residents (n=455)

Time period	Total score (per cent)		
	0–3	4–8	9+
Baseline	72.3	26.4	1.3
3 months	70.5	26.4	3.1
6 months	74.3	23.5	2.2

Note: No sig. diff. p>0.05 chi-square test.

Mean OHAT scores over the study period for all residents for category and total scores are presented in Table 15. There were no significant differences in category scores. However, mean total OHAT scores decreased significantly from the baseline score over the study period, from 2.71 at baseline to 2.50 at 3 months and 2.40 at 6 months.

Table 15: Mean OHAT scores over study period for all residents (n=455)

Category	Mean baseline score	Mean 3-month score	Mean 6-month score
Lips	0.29	0.30	0.27
Tongue	0.27	0.27	0.25
Gums and tissues	0.29	0.24	0.20
Saliva	0.16	0.13	0.13
Natural teeth	0.72 (n=305)	0.68 (n=311)	0.62 (n=327)
Dentures	0.57 (n=373)	0.53 (n=365)	0.51 (n=389)
Oral cleanliness	0.65	0.56	0.57
Dental pain	0.14	0.11	0.12
Total score	**2.71**	**2.50***	**2.40****

* sig. p<0.01 between baseline and 3-month total scores
** sig. p<0.01 between baseline and 6-month total scores

Note: No sig. differences between 3- and 6-month scores.

Reliability

The intra-examiner and inter-examiner reliability for individual OHAT categories and total score is presented in Table 16. There were no significant differences for having a diagnosed dementia, Resident Classification Score, consent type and mean baseline OHAT score between participants who completed all three phases and those 20 residents who completed the first two phases but deceased after 3 months (and did not complete the 6-month study phase). Thus, Table 16 includes reliability data for 475 residents: the 455 residents who completed all three study phases plus an additional 20 residents who completed the first two study phases but had deceased by the third study phase at 6 months. Intra-examiner percentage agreement for individual categories ranged from 74.4% for oral cleanliness to 93.9% for dental pain and 96.6% for referral to dentist. Intra-examiner Kappa statistics were in the moderate range (0.51–0.60) for lips, saliva, oral cleanliness and referral to dentist. All other categories had an intra-examiner Kappa statistic in the range of 0.61–0.80 indicating substantial agreement. The Pearson correlation coefficient for intra-examiner total OHAT score was 0.78, and all intra-examiner analyses were statistically significant.

Inter-examiner percentage agreement for individual categories ranged from 72.6% for oral cleanliness to 92.6% for dental pain and 96.8% for referral to a dentist. Inter-examiner Kappa statistics were in the moderate range (0.47–0.60) for lips, tongue, gums, saliva, oral cleanliness and referral to a dentist. All other categories had an inter-examiner Kappa statistic in the range of 0.62–0.66 indicating substantial agreement. Pearson correlation coefficient for inter-examiner total OHAT score was 0.74. All inter-examiner analyses were statistically significant.

Table 16: Intra-examiner and inter-examiner reliability for individual OHAT categories and total score[(a)]

	Intra-examiner (n=475)		Inter-examiner (n=475)	
Category	**Percentage agreement**	**Kappa statistic**	**Percentage agreement**	**Kappa statistic**
Lips	79.8	0.52*	78.1	0.48*
Tongue	84.6	0.61*	80.4	0.53*
Gums and tissues	90.5	0.71*	86.1	0.57*
Saliva	88.8	0.51*	86.9	0.48*
Natural teeth	80.6	0.70*	77.9	0.66*
Dentures	83.7	0.70*	80.9	0.65*
Oral cleanliness	74.4	0.56*	72.6	0.54*
Dental pain	93.9	0.66*	92.6	0.62*
Referral to dentist	96.6	0.51*	96.8	0.47*
	Intra-examiner Pearson correlation		**Inter-examiner Pearson correlation**	
Total score		**0.78***		**0.74***

* p<0.001.
(a) Note that 20 residents who completed 3-month data collection but who deceased before 6-month data collection have been included in these reliability analyses (n=455+20=475).

Validity

The percentage agreement and Pearson correlation analyses between OHAT categories and associated dental examination findings (assessments and indices) for 21 residents are presented in Table 17. There was complete agreement on scoring for the lips. Natural teeth, dentures and tongue had the highest significant correlations and high percentage agreements, and the gums also had a significant but lower correlation.

Non-significant and low correlations and percentage agreements were evident for saliva, oral cleanliness and dental pain. In particular, the dentist ratings of plaque accumulation were much higher than those reported on the OHAT.

Table 17: Percentage agreements (%) and Pearson correlations (C) between OHAT categories and associated dental examination findings (assessments and indices) (n=21)

OHAT category	WHO oral mucosal lesions		Clinical xerostomia evaluation		Decayed tooth status		Rise denture assessment		Plaque index		Problems with oral hygiene care	
	%	C	%	C	%	C	%	C	%	C	%	C
Lips	100	1.00*										
Tongue	95.2	0.80*										
Gums and tissues	85.7	0.60*										
Saliva			57.1	0.07								
Natural teeth					86.7	0.88*						
Dentures							92.3	0.94*				
Oral cleanliness									42.9	0.15		
Dental pain											85.7	–0.1

p<0.01.

Oral Hygiene Care Plan

The completion of entries for the dentist details and staff to help with oral hygiene care problems on the OHCPs is presented in Table 18. The areas with the least number of entries were for dentist and dental appointments.

Table 18: Dentist details and staff to help with oral hygiene care problems on OHCP at baseline, 3 months and 6 months (n=455) (per cent)

OHCP item	Baseline		3 months		6 months	
	Yes	No	Yes	No	Yes	No
Entry for 'Dentist'?	29.7	70.3	34.3	65.7	33.2	66.8
Entry for 'Dental appointments'?	14.3	85.7	12.7	87.3	10.1	89.9
Entry for 'Staff to help with oral hygiene care problems'	32.5	67.5	52.7	47.3	44.4	55.6

Denture status listed on the OHCP at baseline, 3 months and 6 months is presented in Table 19. Percentages were similar over the three time periods, with approximately 60% of residents having a full upper denture and 40% having a full lower denture. Approximately 6–7% had a partial upper and/or a partial lower denture, and another 7–9% had a denture that was not worn.

Table 19: Denture status on OHCP at baseline, 3 months and 6 months (n=455) (per cent)

OHCP category	Baseline		3 months		6 months	
	Upper	Lower	Upper	Lower	Upper	Lower
Full	61.8	40.9	60.7	40.2	59.8	39.3
Partial	6.8	5.5	7.7	6.2	6.4	3.5
Not worn	7.3	7.5	7.5	8.1	8.1	9.0
No denture	24.2	46.2	24.2	45.5	25.2	48.1
Named	14.7	9.0	17.1	10.5	21.5	13.2

Carers reported that 22.4% of residents had natural upper teeth and 38.5% had natural lower teeth (Table 20). Percentages of retained tooth roots ranged from 6–9% and increased over the study period.

Table 20: Natural teeth status on OHCP at baseline, 3 months and 6 months (n=455) (per cent)

	Baseline		3 months		6 months	
OHCP category	Upper	Lower	Upper	Lower	Upper	Lower
Natural teeth – yes	22.4	38.5	21.4	39.1	21.1	37.8
Natural teeth – no	71.6	53.2	72.5	53.4	72.7	53.0
Roots present	5.9	8.4	6.1	7.4	9.1	9.2

On the OHCP, one section detailed denture and teeth cleaning attempts (Table 21). The great majority of carers marked that oral hygiene care was attempted daily for residents rather than 'when possible'.

Table 21: Attempt oral hygiene care on OHCP at baseline, 3 months and 6 months (n=455) (per cent)

	Baseline		3 months		6 months	
OHCP category	Daily	When possible	Daily	When possible	Daily	When possible
Attempt denture cleaning	64.6	3.1	62.6	2.2	62.2	2.0
Attempt tooth cleaning	43.5	2.9	46.2	2.2	46.2	2.6

Information completed by carers detailing the best time to clean dentures/natural teeth is presented in Table 22. A trend was evident in which similar percentages of carers listed dentures as being best cleaned either in the morning and evening, or only in the evening. Natural teeth were listed most frequently as best being cleaned in the morning and evening and similar percentages were listed at each alternate time once per day. Low percentages listed denture/teeth cleaning to be completed three times daily or after each meal. Approximately 3% listed 'whenever possible'.

Table 22: Best time to clean dentures / natural teeth on OHCP at baseline, 3 months and 6 months (n=455) (per cent)

	Baseline		3 months		6 months	
OHCP category	Dentures	Natural teeth	Dentures	Natural teeth	Dentures	Natural teeth
Whenever possible	3.6	3.8	2.9	2.9	3.1	3.1
Morning and evening	21.3	19.1	19.1	19.3	20.4	20.4
Morning	5.8	8.1	5.1	8.5	5.4	7.9
Evening	26.3	8.8	27.9	11.5	24.5	10.9
After each meal ('and at night soak dentures' or '3 times a day')	10.1	3.8	5.9	3.8	5.7	2.0
No answer	33.1	56.4	39.1	54.0	40.9	55.7

Types and frequency of assistance needed with oral hygiene care on OHCP at baseline, 3 months and 6 months are presented in Table 23. Approximately 60% of residents required full assistance with oral hygiene care over the study period, with only one-fifth not requiring assistance. Over 20% needed reminding, prompting or the use of task breakdown strategies. Over 20% needed supervision or checking of oral hygiene care. Individual oral hygiene care strategies were listed for approximately 10% of residents, the highest being the use of high-concentration fluoride 5,000 ppm toothpaste.

Table 23: Types and frequency of assistance needed with oral hygiene care on OHCP at baseline, 3 months and 6 months (n=455) (per cent)

OHCP category	Baseline	3 months	6 months
No assistance needed	18.5	16.0	14.5
Reminding / prompting / task breakdown needed	21.5	20.0	24.2
Supervision/checking of oral hygiene needed	27.5	22.2	28.1
Full assistance needed from staff	57.6	60.2	63.7
Use bridging/chaining/distraction techniques	7.0	6.4	7.5
Use electric/suction toothbrush	3.1	3.3	3.7
Use backward bent toothbrush for access	9.0	6.8	8.1
Use biteblock	3.5	4.0	3.3
Use chlorhexidine spray bottle/gel	8.8	11.1	11.4
Use fluoride spray bottle/gel	5.3	1.5	1.1
Use Neutrafluor 5000 toothpaste	12.1	14.1	11.9
Use Oral Balance gel for dry mouth	3.1	6.2	7.0
Other – clean dentures with soap and water	3.4	1.6	1.3
Other – use toothpaste	2.5	4.5	2.7
Other – use Steridents	2.2	2.7	1.3

The regular problems with oral hygiene care encountered by carers are presented in Table 24. The most frequently listed problem was that the resident forgets to do oral hygiene care, followed by their inability to understand the oral hygiene care task. Approximately one-fifth of residents refused oral hygiene care regularly, would not open their mouths and were aggressive or kicked or hit. Less than 10% listed problems such as the resident biting the toothbrush or staff, not being able to swallow properly, and having their head facing downwards. Other problems listed included that the resident doesn't wear denture(s) anymore, can't initiate oral hygiene care, and that Poligrip denture adhesive in the dentures was hard to remove.

Table 24: Regular problems with oral hygiene care on OHCP at baseline, 3 months and 6 months (n=455) (per cent)

OHCP category	Baseline	3 months	6 months
Forgets to do oral hygiene care	44.0	46.8	50.5
Won't open mouth	18.9	24.0	26.6
Refuses oral hygiene care	20.7	25.3	28.1
Does not understand	32.7	31.6	31.9
Is aggressive/kicks/hits	15.6	15.4	17.1
Can't swallow properly	7.3	5.5	6.8
Can't rinse and spit	23.1	21.3	23.7
Bites toothbrush and/or staff	9.0	11.4	11.2
Constantly grinding/chewing	2.6	2.5	3.1
Head faces downwards	7.0	6.6	5.5

Focus groups

Discussions

The following four questions were used to stimulate discussion at the focus groups:

- What priority do oral health and dental issues have in this facility?
- What problems with oral hygiene care do you have with residents, especially residents with dementia?
- Do you think residents should have regular dental assessments by staff and dentists?
- How could residents' oral health be improved?
- What educational initiatives would help you to better provide oral hygiene care?

The following 10 themes were identified from the comments made by the focus group participants: access to dental care, organisational issues, residents with dementia and uncooperative residents, oral assessments (including use of OHAT/OHCP), preventive oral hygiene care products, cleaning teeth, bleeding gums, dentures, infection control and staff training. Examples of comments made by participants for each of the 10 themes are presented in Table 25.

Table 25: Themes identified from comments made in focus group discussions

Theme	Comments
Access to dental care	• 'non-ambulant residents are a problem—transport is difficult' • 'we can't access domiciliary dental services' • 'I just don't know the dental history of the residents' • 'there is no one to accompany the residents out to the dentist' • 'what do we do if the residents refuse to pay for dental care?' • 'it takes too long for the public domiciliary to come and we have to pay a private dentist to come in sooner' • 'we pick up dental problems but the time they have to wait for a dentist is cruel—they lose too much weight' • 'we did have a dental chair here but no-one would use it so we got rid of it in a garage sale last year' • 'assessments and care plan are great but it's frustrating when we can't get access to a public dentist and families won't pay for a private dentist' • 'dental isn't in Medicare like eyes and things and that is really frustrating for us; we got a private dentist who would come and the families wouldn't even return our calls'
Organisational issues	• 'new staff have no idea how to handle dementia residents compared with more experienced and competent staff who realise the importance of good dental health' • 'our DON is very good and we have any dental products that we need but it wasn't like this at other nursing homes' • 'everyone knows it is an issue that needs to be looked at' • 'really honestly it's just right down there on my priority list' • 'there are too many agency people here now' • 'with these new fragmented mini-shifts of 3–4 hrs there is no way at all we can ever get oral hygiene care done' • 'there's no way we can clean teeth on the afternoon shift—dentures OK but they have to do teeth in the morning' • 'it's very much neglected here because of lack of time and dementia behaviour issues' • 'sometimes you are that rushed to get your tasks done that you forget—it's the time factor' • 'we do the assessment and the care plan which is great but its frustrating that we then can't get them to a public dentist and the families won't pay for a private dentist' • 'that's our biggest issue time—these things people can't see so we can leave them behind'
Residents with dementia and uncooperative residents	• 'residents with dementia are difficult to get their mouths open and we think we have cleaned their teeth well but after a meal you know their mouths are full of food again' • 'we really try but the residents are extremely difficult especially the younger men with dementia who are so strong' • 'I have a resident who has bitten and drawn blood before—we had one nurse holding his hands and he screamed and fought' • 'it's tricky—if they do have problems with their teeth it makes them even more crankier and difficult to look at what the dental problem is and they could be in pain and we just don't know because they can't tell us' • 'I sat last night and thought through all our residents and the best ones we have are those who have had all their teeth out and they don't get dental pain—maybe they should all have their teeth out!' • 'we had a resident who recently had a lot of his teeth extracted and now his behaviour is so much better—he's perfect now' • 'putting something in someone's mouth is very invasive' • 'if I come in to a facility like this I am having all my teeth removed' • 'some of the dementia residents get 3 or 4 Panamax a day because we think they have dental pain but we aren't sure where—we should be more preventive before things get to this stage'

(continued)

Table 25: Themes identified from comments made in focus group discussions (continued)

Theme	Comments
Residents with dementia and uncooperative residents (cont.)	• 'for all we know a lot of the dementia behaviour problems are from their teeth' • 'I believe a lot of their pain is from their teeth' • 'if their problem is aggression I think it could be because they can't say that they have a toothache—there's nothing worse than toothache' • 'just take all their teeth out—you don't want to waste money on people with rotting decayed teeth' • 'the ones we have the most problems with are the ones with teeth' • 'with some of the dementia residents we are flat out just getting out their false teeth let alone getting their teeth cleaned' • 'it's our worst nightmare—those with their own teeth' • 'they just won't open their mouths' • 'a NO is a NO' • 'even when I am shaving or feeding them they jump and I wonder if it is something wrong with their teeth' • 'she came in here when her husband died and everything was bad—her teeth too' • 'if they are aggressive you feel like you might do more damage using a toothbrush' • 'we look for grimacing' • 'people behave differently in different settings and with different people—some residents are great and cooperative with the dentist, doctor or family but they won't let us regular staff near them' • 'if 2 or 3 people have to hold their hands to get it done then that's not worth the while so we say 'let's leave and go'' • 'people wander and take other residents' dentures' • 'if they have teeth and have dementia and are on a soft diet and they say no to oral hygiene we have tended to say don't worry about it—I won't put them through all the fighting and screaming just to clean their teeth and if they are black and rotted anyway it doesn't matter and we'll leave them alone—we can see their teeth are rotten' • 'it depends on who it is that asks the resident to do something—we do the good guy / bad guy thing—it's a well known technique we've used for years to get their hair washed' • 'do oral care anywhere they are cooperative—spa bath is good'
Oral assessments (including use of OHAT/OHCP)	• 'I think regular oral assessment is a good idea' • 'the oral hygiene care plan is simple' • 'somebody in the facility should do assessments and it doesn't need to be a dentist but we need to know what to do if we do find something' • 'we are now teaching this to the nursing students coming through our facility' • 'we like the train-the-trainer method' • 'at any place I have ever worked the only assessment that we've made is whether they've got their own teeth, dentures, partial plates or full plates and maybe label them and that's it' • 'we had a couple of residents who were hospitalised and we really noticed the differences in their level of dental hygiene when they returned to us, so it is important to do an assessment when they return from hospital' • 'we have a chart that has to be signed every time for oral care for a resident because her family are just so pedantic about it' • 'we couldn't do the assessments in between other tasks so we got together as a group and did it after we had done everything' • 'dementia residents can't poke out their tongue to check it' • 'this made us realise that residents' behaviour can be changed if there is something wrong with their teeth' • 'you noticed a lot more changes over time when teeth and gums got better—doing this really improved the quality of care' • 'it was very interesting and we looked better than we would normally look' • 'this is now infiltrating among staff so that it is second nature' • 'we are now doing a dental audit for all new residents'

(continued)

Table 25: Themes identified from comments made in focus group discussions (continued)

Theme	Comments
Preventive oral hygiene care products	• 'we use big jumbo swabs so we don't have to use our fingers' • 'residents have to buy dental products themselves if they are recommended by the dentist' • 'electric toothbrushes are a lot easier and work well' • 'if you don't turn the electric toothbrush off in the mouth the blood and stuff all goes everywhere' • 'staff don't put the lids back on toothpaste' • 'we colour coded for the different continence, dental and other products each resident needs and put dots on their cupboard doors and a copy of the care plan inside their cupboard door' • 'toothbrushes are not labelled and stored properly—it's a big problem as they all get mixed up—it's revolting and it's worse in rooms of 3 or 4 residents' • 'our toothbrushes are cheap and nasty' • 'there is such confusion over who supplies toothbrushes and dental stuff—they don't like to have to pay for extra things'
Cleaning teeth	• 'I am scared when they choke when you clean their teeth' • 'I just don't know what to do with natural teeth' • 'cleaning teeth after every meal is impossible' • 'it would be nice to do it twice daily but that's not going to happen' • 'it is good when relatives help, especially when they've been doing it at home' • 'in all honesty we are never cleaning the mouth of all the food, ever' • 'many we can't give them a drink to get rid of all the food' • 'staff are using too much toothpaste and it just sits there and won't go down or come out'
Bleeding gums	• 'we tried to get into her mouth but when we did her mouth bled so they said not to do it anymore' • 'if a resident spits out blood it scares them' • 'some staff don't like the idea of bleeding gums and scared and think they have hurt the resident'
Dentures	• 'teeth to me means dentures, not their own teeth' • 'we try to mark names on most dentures but some aren't done' • 'one time we didn't even know that this resident had a partial plate and we never took it out' • 'I don't think they need dentures to eat, lots of them take them out to eat anyway' • 'I hate taking out dentures that have had Poligrip on them—you can't get it out when you clean them' • 'families want the dentures in but the residents don't' • 'sometimes we just leave dentures in because if they are in a bad mood you might lose your finger trying to take them out' • 'he's always taking his dentures out and we find them turning up in all sorts of places' • 'we were out feeding the birds fish and chips and she threw her denture to the seagulls and one took off with the denture' • 'they don't like dentures out of the mouth for too long and want them straight back' • 'dentures are always going missing in the laundry' • 'if they have a small mouth we take their denture out to feed them so we can then at least get a small spoon in there' • 'they get to stage when they won't wear their dentures anymore and they spit them out' • 'it's hard to put partial plates in and out—it's an art to take those clasps out and they get easily stuck'

(continued)

Table 25: Themes identified from comments made in focus group discussions (continued)

Theme	Comments
Dentures (cont.)	• 'expectations of family about residents' dentures are far greater than the ability of the staff' • 'their mouths seem to get smaller and we can't get the big dentures in and out—they look so big and funny' • 'families often spend a lot of money on dentures and get a poor result'
Infection control	• 'electric toothbrushes flick too much blood around' • 'blood and saliva contact worries staff' • 'as well as gloves we should all wear safety glasses but we don't—the toothpaste just gets everywhere'
Staff training	• 'we want useful tips that can make the job easier and will make people more likely to try, otherwise they will say it's too hard and let it go by-the-by' • 'we just need really basic training in how to brush someone else's teeth' • 'we want a coordinated approach to overall assessment of swallowing, mealtimes, nutrition and oral care—they have common problems' • 'we get more staff attending to training on a group of topics and not just dental on its own'

Questionnaire

Responses to the focus group questionnaire from participating RACF care staff are presented in Table 26. The great majority of carers agreed or strongly agreed with the statements concerning the use and completion of both the OHAT and OHCP.
A distinct subgroup of these participants responded that they did not have adequate time to learn about the OHAT/OHCP, and one group were not able to complete the dental pain category. Another subgroup reported difficulty completing the dentist details section of the OHCP. Three-quarters of the 3-month focus group questionnaires, and one-quarter of the 6-month focus group questionnaires, were completed. There were no statistically significant differences among responses from the 3- and 6-month participants. Mean reported time taken to complete the OHAT was 7.8 minutes (range 1–30 minutes) (s.d.=5.6) and the OHCP 8.3 minutes (range 1–30 minutes) (s.d.=5.8).

Table 26: Responses to focus group questionnaire (n=60) (per cent)

	Oral Health Assessment Tool (OHAT)	Strongly disagree	Disagree	Agree	Strongly agree
1.	I feel knowledgeable and prepared to use the Oral Health Assessment Tool.	0.0	3.3	68.3	28.3
2.	Using the Oral Health Assessment Tool improves my ability to detect dental pain and problems in residents' mouths.	1.7	0.0	65.0	33.3
3.	I had enough time to learn about the Oral Health Assessment Tool before it was implemented.	1.7	18.3	61.7	18.3
4.	I feel supported in my efforts to implement the Oral Health Assessment Tool for residents.	0.0	0.0	75.0	25.0
5.	I am able to complete the 'lips' category of the Oral Health Assessment Tool.	0.0	0.0	63.3	36.7
6.	I am able to complete the 'tongue' category of the Oral Health Assessment Tool.	0.0	0.0	71.7	28.3
7.	I am able to complete the 'gums and tissues' category of the Oral Health Assessment Health Tool.	0.0	1.7	73.3	25.0
8.	I am able to complete the 'saliva' category of the Oral Health Assessment Tool.	0.0	0.0	75.0	25.0
9.	I am able to complete the 'natural teeth' category of the Oral Health Assessment Tool.	0.0	6.7	65.0	28.3
10.	I am able to complete the 'dentures' category of the Oral Health Assessment Tool.	0.0	0.0	68.3	31.7
11.	I am able to complete the 'oral cleanliness' category of the Oral Health Assessment Tool.	0.0	0.0	73.3	26.7
12.	I am able to complete the 'dental pain' category of the Oral Health Assessment Tool.	5.1	6.8	69.5	18.6
13.	I feel knowledgeable and prepared to use the Oral Hygiene Care Plan.	1.7	3.3	63.3	31.7
14.	Using the Oral Hygiene Care Plan enhances the quality of oral hygiene care I provide for residents.	0.0	0.0	61.7	38.3
15.	I had enough time to learn about the Oral Hygiene Care Plan before it was implemented.	1.7	15.0	61.7	21.7
16.	I feel supported in my efforts to implement the Oral Hygiene Care Plan for residents.	0.0	3.3	68.3	28.3
17.	I am able to complete the 'dentist details' section of the Oral Hygiene Care Plan.	3.3	18.3	63.3	15.0
18.	I am able to complete the 'dentures' section of the Oral Hygiene Care Plan.	0.0	0.0	68.3	31.7
19.	I am able to complete the 'natural teeth' section of the Oral Hygiene Care Plan.	0.0	1.7	68.3	30.0
20.	I am able to complete the 'assistance with oral hygiene care' section of the Oral Hygiene Care Plan.	0.0	0.0	68.3	31.7
21.	I am able to complete the 'regular problems with oral hygiene care' section of the Oral Hygiene Care Plan.	0.0	0.0	75.0	25.0

Two questions were asked concerning 'problems you have been having when using the Oral Health Assessment Tool' and 'problems you have been having when using the Oral Hygiene Care Plan'. Thirty-seven respondents made comments concerning the OHAT and seven of these stated they had 'no problems'. The main themes identified from these OHAT comments were:

- integration of OHAT – 'timing to fit it on between meals and outings' in comparison with 'is now a part of our care.'
- training – 'I wasn't confident enough and another training session would have been good'; 'more specific training on resistive and behaviourally difficult residents would be useful'.
- inadequate understanding – 'difficult to assess pain in residents with dementia'; 'pain assessment was a problem'; 'I needed to ask for help with the saliva and gum sections'.
- evaluation section – 'at the end of the OHAT there should be an evaluation-type section'.
- missing information – 'no halitosis section'; 'need somewhere to write if resident has natural teeth, dentures or both'; 'would like a visual mouth picture to be able to draw and make notes on'.
- resident issues – 'residents don't like the invasion into their mouths and say 'why bother' and 'don't worry dear my teeth are fine''; 'harder with more demented residents who can't give information and who may not open their mouths and don't understand what is happening'; 'dentures are easier and harder with natural teeth'; 'time varies depending on the resident's dementia level and resistiveness'; 'some difficulty gaining residents' confidence'; 'two staff were required with those with behavioural difficulties'.

Twenty-seven respondents made comments concerning the OHCP and three of these stated they had 'no problems'. The main themes identified from these OHCP comments were:

- staff issues – 'some carers may not follow up on the assessments if this is not a priority for them'; 'frustrated with new staff who need even more education in oral care as they are not consistent'; 'sometimes other staff don't understand what oral hygiene changes you are trying to implement'.
- OHCP format – 'need more space to write in interventions and actions' and 'more extra comment areas'.
- residents' dentists – 'I can't find out who residents last visited for dental work'; 'residents have to wait too long to access dental care'; 'I was not confident with knowing dentist's details'.

3.2 Discussion

Although all RACF questionnaire scores increased over the study period, it is important to note that this was not a long-term evaluation of the RACF's involvement in dental issues, and that further evaluation in the longer term is needed. The increase in involvement in dental issues could well be the direct result of the facilities' involvement in the study, and completion of another such facility questionnaire in these 21 facilities at several annual periods would be useful data to collect. It would also be useful in future to conduct more focus groups with RACF staff and evaluate their perceptions of dental issues in the individual facilities over time, especially those that have implemented the OHAT and OHCP on an ongoing basis. The study did increase the awareness of dental issues in the RACFs, but it was interesting to note that there were much higher percentages of residents with OHAT scores of '1' or '2' (indicating that a referral to a dentist was warranted) than ticked boxes below the OHAT categories (indicating that actual referrals to a dentist were made). The small percentage of residents who were referred to a dentist had OHAT category and total scores indicating that more major dental problems may exist. Feedback from staff in the qualitative questionnaires and interviews highlighted that these referrals were very much influenced by the ability of the individual facility to access a dentist, which was especially problematic in rural areas. Another likely influence on the lack of dentist referrals was the staff's perception and experiences with both residents and their families/guardians refusing to have an examination by a dentist and/or dental treatment. This was primarily related to financial issues and a decreased perception of need for dental care. As stated by one RN, 'one family even said to me "well you don't need to waste money if she has rotten old teeth anyway"'.

There were several improvements made to the OHAT and OHCP as a result of the data collected and the comments obtained in this study (see Appendices 6 and 7). In the category title for natural teeth and dentures the words 'Yes/No' were added so that staff could more easily mark if the resident did or did not have natural teeth and/or dentures without having to refer to the OHCP. Additional OHAT category descriptors were 'halitosis' in the oral cleanliness category, and 'loose' or 'needs denture adhesive' in the denture category. At the bottom of the OHAT the 'action box' was increased from 'organise for resident to have a dental examination by a dentist' to also include the following options: 'resident and/or family/guardian refuses dental treatment', 'complete OHCP and start oral hygiene care interventions for resident' and 'review resident's oral health again on Date….'. The OHAT instructions were also modified to read 'you can circle individual words as well as giving a score in each category'. In the OHCP, there was an addition made to rename the section titled 'types and frequency of assistance needed with oral hygiene care' to 'interventions for oral hygiene care' so that staff could better link the regular problems with oral hygiene care to actual interventions. In the denture section the option of 'does/doesn't wear at night' was added. In the 'best time and person to clean dentures/teeth' sections, the words '(staff/relative)' were added to try to encourage communication between families and staff concerning oral hygiene care. In the list of regular problems with oral hygiene care, 'no compliance with directions' was added as was 'moves' to the 'head faces downwards' problem. In the interventions for oral hygiene care section, three extra options were added for basic cleaning with a 1,000 ppm toothpaste and also for scrubbing and soaking of dentures.

These modifications were made to further assist with translation of the OHAT findings and OHCP information into practice. However, as it was found that every facility had its own individualised requirements for policies and procedures, no further directives were added. Such requirements need to be specified by each RACF, and could include: a short oral hygiene intervention list that could be used daily on handover sheets or an additional sheet that details problems; a visual diagram of the teeth and mouth for staff to make comments and drawings on; and strategies and interventions more comprehensively detailed and linked to individual oral hygiene care problems. Several interesting comments highlighted the need for better integration of care plans concerning dental, nutritional, mealtime and swallowing issues. The replication and dissemination of care plan information in RACFs is an issue being tackled by the Australian Government Department of Health and Ageing (2004), and dental issues must be incorporated into further changes in aged care documentation. Another important issue is the need to regularly provide feedback to staff and increase acknowledgment of good work in oral hygiene care on particularly difficult residents. Note that although it was made very clear to the research team that most staff, including both RNs and personal care attendants, found it difficult to find information about the residents' dentist and dental history, this section was retained in the OHCP.

Were the study outcomes achieved? It was interesting how the study highlighted an increased awareness of the diversity of oral health policies and procedures among organisations and individual facilities. Several had attempted to institute some type of dental screening assessment procedure on their own initiative. Approximately half of the facilities in the study reported using the OHAT and OHCP in the same or an individualised format even after the study had ended. OHAT and OHCP outcomes can be individualised by facilities to include: diminishing of residents' dental problems; documentation of improvement or decline in residents' oral health status and oral hygiene care; evaluation of behaviour management strategies for oral hygiene care provision; numbers of referrals to dentists; and dental examinations conducted by dentists. Although general information was developed that is available for use in Australian residential care facilities, in accordance with the Commonwealth Residential Aged Care Oral and Dental Standard 2.15, it is essential to ensure the ability for the individualisation and use of such information throughout the aged care industry. Such information will also need to be updated by both the dental profession and the aged care industry as accreditation and documentation requirements change over time.

The qualitative and quantitative data substantiated the hypothesis that carers' involvement in maintenance of residents' oral health was improved by the use of the OHAT. Carers found the OHAT user-friendly and, as was stated by many of the study participants, 'it was very interesting and we (RACF staff) looked better than we would normally look'. Increased advocacy for and interest in dental issues in the RACFs was evident both during and at the end of the study period: 'this (is) now infiltrating among staff so that it is second nature' and 'we are now doing a dental audit for all new residents'. Carers' involvement in the delivery of residents' oral hygiene care was improved over the study period by the use of the OHCP. Carers commented that they 'noticed a lot more changes over time when teeth and gums got better—doing this really improved the quality of care'.

These positive responses from staff exemplified that many RACFs embraced the focus on oral health, and that 'everyone knows it is an issue that needs to be looked at'. Interestingly, similar comments concerning dental issues were also made in two other recent reports. 'The Practical Oral Care Video' was disseminated nationally to dental professionals and RACFs during a recent Australian Dental Association Dental Awareness Month. In an evaluation of this video, purchasers remarked that 'this is a really big issue in both high and low care and this video sparks awareness and reinforces many issues staff have identified but find it difficult to address' and 'prior to obtaining this video we only had basic oral care but we have realized that we need to extend our oral care program' (Chalmers et al. 2005). The OHAT and OHCP were also used in the 2003 Commonwealth Trial of the Draft National Framework for Documenting Care in Residential Aged Care Services (Australian Government Department of Health and Ageing 2004). Both the OHAT and OHCP were 'rated very highly' in the Commonwealth trial with feedback such as 'helped us identify things we weren't alerted to before', 'was easy to fill out and put in the care plan', 'triggered new work on our part', and 'provided a lot more information and a lot more prompting'. 'One facility, having used the tool in the trial, had identified the need for regular dental checks for all residents, having identified a number of dental problems for residents which had gone unnoticed' (Australian Government Department of Health and Ageing 2004).

However, it is also very important to note that not all RACFs embraced this study—there were two facilities from the original sample of 23 that did not complete the study. Two other facilities completed the study but had low baseline questionnaire scores that did not markedly improve at 6 months. Many RACFs are currently undergoing extensive re-building and renovation; at such times it is very difficult for staff to focus on new initiatives and research in addition to their daily, regular duties. Even financial incentives could not induce these facilities to complete the study as they felt they were too burdened with physical and organisational issues at that time. In the initial Kayser-Jones study, the workload of the participating staff was reduced by 30%, whereas in this study the staff's time and the employment of extra staff were paid for (Kayser-Jones et al. 1995). However, it is important to note that, even with these initiatives, there were problems with workload and time commitments in both studies. Such considerations need to be incorporated into any future clinical, research and oral health promotional initiatives in the aged care industry. Also, considerable organisational challenges were encountered with the need for multiple approvals from boards and ethics committees for individual RACFs to participate in this research. Indeed, conflict was often evident between RACFs that wanted to participate and their 'off-site' organisational controlling bodies, which complicated their enthusiasm for participation. Such challenges may prohibit the practical implementation of research in Australian RACFs in future and needs to be carefully investigated in future study designs. Note that these organisational challenges were mainly encountered in one particular state in this study, and may not be as relevant in all Australian states.

The quantitative and qualitative data from both this and previous BOSHE studies supported the Oral Health Assessment Tool as a reliable and valid tool in Australian residential care facilities. Kayser-Jones, who developed the BOHSE, recommended 'replication of the study in multiple sites' rather than direct use of the BOHSE in Australian aged care facilities. Thus, considerable peer, professional and industry input was utilised in a pilot study which resulted in the development of a modified version of the BOHSE, termed the OHAT, in this study. Such methodology enabled

modification of the assessment tool to the Australian aged care environment while maintaining its integrity and validity and improving the reliability of the original BOHSE. It was important to ensure that the OHAT was able to be used by all staff ranging from personal care attendants to registered nurses. As has been stated internationally, 'oral assessment is recommended on admission to residential care using criteria which are client centred and which can be used by all grades of staff' (Fiske et al. 2000). All studies to date have used a convenience sample, and that used in this study was the largest sample so far. The self-reported mean time taken to complete the OHAT in this study was slightly shorter (mean = 7.8 minutes) than that reported by observation in other BOHSE studies (mean = 8.7 minutes). However, this was expected as the OHAT has fewer categories than the original BOHSE. Mean OHAT scores (in the range of mean scores 2.4–2.7 over the study period) were also lower than reported mean BOHSE scores (mean = 3.75), as would be expected because the total possible OHAT score was 16 compared to the total possible BOHSE score of 20 (due to the varying numbers of categories). Intra-examiner reliability, percentage agreements and Kappa statistics for individual categories and correlations for total scores were very similar to, or even higher than, those reported in the previous studies (Kayser-Jones et al. 1995; Lin et al. 1999). Inter-examiner reliability was generally higher in this study than in previous studies. The previous studies were conducted at one point in time whereas this study was conducted over a longer time period. Thus, participants had more time to become familiar with the OHAT. Although, in this and previous studies, the content and face validity of the BOHSE and OHAT was established, adequate concurrent validity was not established for several categories. These were the same categories that participants reported difficulties with in qualitative questionnaires and focus groups. Future research and training initiatives with these tools will need to focus on improvement in the categories of saliva, oral cleanliness and dental pain.

A variety of residential aged care staff have used both the BOHSE and the OHAT. The aim of this study was to further simplify the original BOHSE so that it could be used by all RACF staff from RNs through to personal care attendants and, ideally, by interactions between all staff groups. Even though the complexity of the BOHSE was reduced in the OHAT, there were still several areas in which carers were not confident, including saliva, oral cleanliness and dental pain. In the initial BOHSE study nurses found the tongue examination with gauze and light 'challenging', as was the use of the tongue blade; thus, their use was not continued in the OHAT study. Indeed, the OHAT is clearly indicated for use only as a screening assessment tool which uses no 'special dental equipment' with the exception of gloves and the best available natural or artificial light source. If the OHAT can increase staff's interest and capabilities in dental screenings, it can be routinely used to monitor residents' oral health, evaluate oral hygiene care interventions, act as a trigger to call in a dentist when required, help with residents' individualised oral hygiene care planning and help with triaging and prioritisation of residents' dental needs. These are especially important initiatives when attendance of dental professionals to the facility is limited or financially costly (Pearson & Chalmers 2004). Although training was provided to the study participants, comments indicated that participants wanted a 're-usable', tangible and visual training resource that they could refer to and easily access. Suggestions included a CD 'training program', visual prompts for the OHAT and OHCP that could be placed in residents' records, oral hygiene care interventions that could be placed inside residents' cupboards, and 'dental handover sheets' for changes of shifts. Such resources are continuing to be developed by the investigators.

4 Conclusion

In this study, the use of oral and dental policies and procedures, an Oral Health Assessment Tool (OHAT) and an Oral Hygiene Care Plan improved carers' involvement in maintenance of residents' oral health and the delivery of oral hygiene care in Australian residential care facilities. The OHAT was evaluated as being a reliable and valid screening tool for use in Australian residential care facilities, including with cognitively impaired residents.

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Appendix A: Brief Oral Health Status Examination (BOHSE)

Kayser Jones - Brief Oral Health Status Examination (BOHSE)

Resident's Name _____ Date _____
Examiner's Name _____ Total Score _____

Category	Measurement	0	1	2
Lymph nodes	Observe and feel nodes	No enlargement	Enlarged, not tender	Enlarged and tender)
Lips	Observe, feel tissue and ask resident, family or staff (eg., primary caregiver)	Smooth, pink, moist	Dry, chapped or red at corners*	White or red patch, bleeding or ulcer for 2 weeks*
Tongue	Observe, feel tissue and ask resident, family or staff (eg., primary caregiver)	Normal roughness, pink and moist	Coated, smooth. Patchy, severely fissured or some redness	Red, smooth, white or red patch; ulcer for 2 weeks*
Tissue inside cheek, floor & roof of mouth	Observe, feel tissue and ask resident, family or staff (eg., primary caregiver)	Pink and moist	Dry, shiny, rough, red or swollen*	White or red patch, bleeding, hardness or ulcer for 2 weeks*
Gums between teeth &/or under artificial teeth	Gently press gums with tip of tongue blade	Pink, small indentations; firm, smooth and pink under artificial teeth	Redness at border around 1-6 teeth; one red area or sore spot under artificial teeth*	Swollen or bleeding gums, redness at border around 7 or more teeth, loose teeth, generalized redness or sore under artificial teeth*
Saliva (effect on tissue)	Touch tongue blade to centre of tongue and floor of mouth	Tissues moist, saliva free flowing and watery	Tissues dry and sticky	Tissues parched and red, no saliva*
Condition of natural teeth	Observe and count number of decayed or broken teeth	No decayed or broken teeth/roots	1-3 decayed or broken teeth/roots	4 or more decayed or broken teeth/roots; fewer than 4 teeth in either jaw*
Condition of artificial teeth	Observe, feel tissue and ask resident, family or staff (eg., primary caregiver)	Unbroken teeth; worn most of the time	1 broken/missing tooth, or worn for eating or cosmetic purposes only	More than 1 broken or missing tooth, or either denture missing or never worn*
Pairs of teeth in chewing position (natural or artificial)	Observe and count pairs of teeth in chewing position	12 or more pairs of teeth in chewing position	8-11 pairs of teeth in chewing position	0-7 pairs of teeth in chewing position*
Oral cleanliness	Observe appearance of teeth and dentures	Clean, no food particles/tartar in the mouth or on artificial teeth	Food particles/tartar in one or two places in the mouth or on artificial teeth	Food particles/tartar in most places in the mouth or on artificial teeth

* Refer to dentist immediately

Appendix B: Oral Health Assessment Tool for dental screening

Oral Health Assessment Tool for dental screening (modified from Kayser-Jones et al (1995) by Chalmers (2000))

Resident: _____ Room: _____ Study ID _____				Baseline / 3-mths / 6-mths *(please circle)*
Category	**Scores** *(* if score 1 or 2 for any category please arrange for a dentist to assess the resident)*			Completed by: _____ Date: ___/___/___
	0 = healthy	**1 = changes ***	**2 = unhealthy ***	**Category scores**
Lips	smooth, pink, moist	dry, chapped, or red at corners	swelling or lump, white/red/ulcerated patch; bleeding/ulcerated at corners	
Tongue	normal, moist roughness, pink,	patchy, fissured, red, coated	patch that is red &/or white, ulcerated, swollen	
Gums and tissues	pink, moist, smooth, no bleeding	dry, shiny, rough, red, swollen, one ulcer/sore spot under dentures	swollen, bleeding, ulcers, white/red patches, generalised redness under dentures	
Saliva	moist tissues, watery and free flowing saliva	dry, sticky tissues, little saliva present, resident thinks they have a dry mouth	tissues parched and red, very little/no saliva present, saliva is thick, resident thinks they have a dry mouth	
Natural teeth	no decayed or broken teeth/roots	1-3 decayed or broken teeth/roots	4 + decayed or broken teeth/roots, or less than 4 teeth	
Dentures	no broken areas or teeth, dentures regularly worn, and named	1 broken area/ tooth or dentures only worn for 1-2 hrs daily, or dentures not named	more than 1 broken area/tooth, denture missing or not worn, needs denture adhesive, or not named	
Oral cleanliness	clean and no food particles or tartar in mouth or on dentures	food particles/ tartar/ plaque in 1-2 areas of the mouth or on small area of dentures	food particles/tartar/plaque in most areas of the mouth or on most of dentures	
Dental pain	no behavioural, verbal, or physical signs of dental pain	are verbal &/or behavioural signs of pain such as pulling at face, chewing lips, not eating, aggression	are physical pain signs (swelling of cheek or gum, broken teeth, ulcers), as well as verbal &/or behavioural signs (pulling at face, not eating, aggression)	
Please tick this box if the resident was referred to a dentist after screening ☐				**TOTAL SCORE ____/16**

Appendix C: Oral Hygiene Care Plan used in study

Oral Hygiene Care Plan (Chalmers, 2000)

Resident: _____ **Study ID:** _____ ***baseline / 3-mth / 6-mth***

Completed by: _____ **Date:** __/__/__ ***(please circle)***

Dentist: *public or private (please circle)* **Name:** _____ **Phone:** _____

List all dental appointments:

Staff to help with oral hygiene care problems: _____

Dentures:	Upper	Full / Partial / Not worn/ No denture/ Named	Attempt denture cleaning: ☐ daily ☐ when possible
(please circle)	Lower	Full / Partial / Not worn/ No denture/ Named	Best time to clean dentures: _____
Natural teeth:	Upper	Yes / No / Roots present	Attempt teeth cleaning: ☐ daily ☐ when possible
(please circle)	Lower	Yes / No / Roots present	Best time to clean teeth : _____

Types and frequency of assistance needed with oral hygiene care *(please tick all that apply and circle frequency required)*

- ☐ no assistance needed
- ☐ reminding / prompting / task breakdown needed
- ☐ supervision/checking of oral hygiene needed
- ☐ full assistance needed from staff
- ☐ use bridging / chaining / distraction techniques
- ☐ use electric / suction toothbrush
- ☐ use backward bent toothbrush for access
- ☐ use biteblock
- ☐ use chlorhexidine spray bottle/gel *daily/weekly*
- ☐ use fluoride spray bottle/gel *daily/weekly*
- ☐ use Neutrafluor 5000 toothpaste *daily/weekly*
- ☐ use Oral Balance gel for dry mouth
- ☐ other _____

Regular problems with oral hygiene care : *(please tick all that apply)*

- ☐ forgets to do oral hygiene care
- ☐ won't open mouth
- ☐ refuses oral hygiene care
- ☐ does not understand
- ☐ is aggressive / kicks / hits
- ☐ can't swallow properly
- ☐ can't rinse and spit
- ☐ bites tocthbrush and/or staff
- ☐ constantly grinding/chewing
- ☐ head faces downwards
- ☐ other _____

Appendix D: Facility score sheet used at baseline and 6 months

Facility issue	0	1	2	3	Score
1. Are there written oral and dental policies and procedures for the facility?	None were evident	Yes, but inadequate (ie., less than required by dental standard)	Yes, adequate (ie., equivalent to dental standard)	Yes, more than adequate (ie., more than required by dental standard)	
2. Was continuing education (CE) in oral health held in prior 12 months?	None was held	Yes, 1 session	Yes, 2 sessions	Yes, 3 or more sessions	
3. What was the CE format?	None was held	Lecture only	Hands-on /practical discussion	Oral care demonstrations with residents	
4. Is there a contact list of public dentists/clinics?	None	Yes, but inadequate (ie., less than required by dental standard)	Yes, adequate (ie., equivalent to dental standard)	Yes, more than adequate (ie., more than required by dental standard)	
5. Is there a contact list of private dentists?	None	Yes, but inadequate (ie., less than required by dental standard)	Yes, adequate (ie., equivalent to dental standard)	Yes, more than adequate (ie., more than required by dental standard)	
6. Are oral assessments completed for new residents by staff?	None	Yes, but inadequate (ie., only as requested)	Yes, adequate (ie., is required for some residents)	Yes, more than adequate (ie., is required for all residents)	
7. Are oral assessments completed for new residents by a dentist?	None	Yes, but inadequate (ie., only as requested)	Yes, adequate (ie., is required for some residents)	Yes, more than adequate (ie., is required for all residents)	
8. Do staff complete oral assessments regularly/annually for residents ?	None	Yes, but inadequate (ie., only as requested)	Yes, adequate (ie., is required for some residents)	Yes, more than adequate (ie., is required for all residents)	
9. So dentists complete oral assessments regularly/annually for residents?	None	Yes, but inadequate (ie., only as requested)	Yes, adequate (ie., is required for some residents)	Yes, more than adequate (ie., is required for all residents)	
10. Is there an oral hygiene care plan in each resident's record?	None	Yes, but inadequate (ie., less than required by dental standard)	Yes, adequate (ie., equivalent to dental standard)	Yes, more than adequate (ie., more than required by dental standard)	
11. Is there a place in residents' records to list their dentist?	None	Yes, but inadequate (ie., less than required by dental standard)	Yes, adequate (ie., equivalent to dental standard)	Yes, more than adequate (ie., more than required by dental standard)	
12. Are there oral health initiatives *in addition to the dental standard requirements* in the facility?	None	Yes, good (ie., using preventive dental products such as fluorides)	Yes, very good (ie., dementia-specific oral care strategies)	Yes, excellent (ie., specific oral care staff allocated)	
Facility: _____ **Facility Study ID:** _____ **Form completed by:** _____ **DATE:** ____/____/03 **baseline/6 months**					**TOTAL SCORE** ____/36

Appendix E: Focus group questionnaire

dental health
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teeth for life

THE UNIVERSITY OF ADELAIDE
AUSTRALIA

A best-practice oral health model for Australian residential care

Focus Group Questionnaire

Date of focus group ___/___/___ Conducted by: _____

Residential Care Facility: _____

Please circle: 3-months / 6-months

Appendix E: Focus group questionnaire (continued)

Oral Assessment Tool		Strongly Disagree	Disagree	Agree	Strongly Agree
1.	I feel knowledgeable and prepared to use the Oral Assessment Tool.	1	2	3	4
2.	Using the Oral Assessment Tool improves my ability to detect dental pain and problems in residents' mouths.	1	2	3	4
3.	I had enough time to learn about the Oral Assessment Tool before it was implemented.	1	2	3	4
4.	I feel supported in my efforts to implement the Oral Hygiene Care Plan for residents.	1	2	3	4
5.	I am able to complete the "lips" category of the Oral Assessment Tool.	1	2	3	4
6.	I am able to complete the "tongue" category of the Oral Assessment Tool.	1	2	3	4
7.	I am able to complete the "gums and tissues" category of the Oral Assessment Tool.	1	2	3	4
8.	I am able to complete the "saliva" category of the Oral Assessment Tool.	1	2	3	4
9.	I am able to complete the "natural teeth" category of the Oral Assessment Tool.	1	2	3	4
10.	I am able to complete the "dentures" category of the Oral Assessment Tool.	1	2	3	4
11.	I am able to complete the "oral cleanliness" category of the Oral Assessment Tool.	1	2	3	4
12.	I am able to complete the "dental pain" category of the Oral Assessment Tool.	1	2	3	4
		Strongly Disagree	Disagree	Agree	Strongly Agree

Appendix E: Focus group questionnaire (continued)

Oral Hygiene Care Plan		Strongly Disagree	Disagree	Agree	Strongly Agree
13.	I feel knowledgeable and prepared to use the Oral Hygiene Care Plan.	1	2	3	4
14.	Using the Oral Hygiene Care Plan enhances the quality of oral hygiene care I provide for residents.	1	2	3	4
15.	I had enough time to learn about the Oral Hygiene Care Plan before it was implemented.	1	2	3	4
16.	I feel supported in my efforts to implement the Oral Hygiene Care Plan for residents.	1	2	3	4
17.	I am able to complete the "dentist details" section of the Oral Hygiene Care Plan.	1	2	3	4
18.	I am able to complete the "dentures" section of the Oral Hygiene Care Plan.	1	2	3	4
19.	I am able to complete the "natural teeth" section of the Oral Hygiene Care Plan.	1	2	3	4
20.	I am able to complete the "assistance with oral hygiene care" section of the Oral Hygiene Care Plan.	1	2	3	4
21.	I am able to complete the "regular problems with oral hygiene care" section of the Oral Hygiene Care Plan.	1	2	3	4
		Strongly Disagree	**Disagree**	**Agree**	**Strongly Agree**

How many minutes did it usually take you to complete the

Oral Health Assessment Tool: _____ **minutes**

Oral Hygiene Care Plan: _____ **minutes**

Appendix E: Focus group questionnaire (continued)

Please comment about any problems you have been having when using the

Oral Health Assessment Tool:

_____

_____

_____

_____

_____

_____

_____

_____

_____

Please comment about any problems you have been having when using the

Oral Hygiene Care Plan:

_____

_____

_____

_____

_____

_____

_____

_____

Thank you very much for assistance with completing this questionnaire.

Appendix F: Final Oral Health Assessment Tool

Oral Health Assessment Tool (OHAT) for Dental Screening (modified from Kayser-Jones et al (1995) by Chalmers (2004))

Resident: _____ **Completed by:** _____ **Date:** ___/___/___

Scores – *You can circle individual words as well as giving a score in each category (* if 1 or 2 scored for any category please organise for a dentist to examine the resident)*

Category	0 = healthy	1 = changes *	2 = unhealthy *	Category scores
Lips	smooth, pink, moist	dry, chapped, or red at corners	swelling or lump, white/red/ulcerated patch; bleeding/ulcerated at corners	
Tongue	normal, moist roughness, pink,	patchy, fissured, red, coated	patch that is red &/or white, ulcerated, swollen	
Gums and tissues	pink, moist, smooth, no bleeding	dry, shiny, rough, red, swollen, one ulcer/sore spot under dentures	swollen, bleeding, ulcers, white/red patches, generalised redness under dentures	
Saliva	moist tissues, watery and free flowing saliva	dry, sticky tissues, little saliva present, resident thinks they have a dry mouth	tissues parched and red, very little/no saliva present, saliva is thick, resident thinks they have a dry mouth	
Natural teeth Yes/No	no decayed or broken teeth/roots	1-3 decayed or broken teeth/ roots or very worn down teeth	4 + decayed or broken teeth/roots, or very worn down teeth, or less than 4 teeth	
Dentures Yes/No	no broken areas or teeth, dentures regularly worn, and named	1 broken area/ tooth or dentures only worn for 1-2 hrs daily, or dentures not named, or loose	more than 1 broken area/tooth, denture missing or not worn, loose and needs denture adhesive, or not named	
Oral cleanliness	clean and no food particles or tartar in mouth or dentures	food particles/ tartar/ plaque in 1-2 areas of the mouth or on small area of dentures or halitosis (bad breath)	food particles/tartar/plaque in most areas of the mouth or on most of dentures or severe halitosis (bad breath)	
Dental pain	no behavioural, verbal, or physical signs of dental pain	are verbal &/or behavioural signs of pain such as pulling at face, chewing lips, not eating, aggression	are physical pain signs (swelling of cheek or gum, broken teeth, ulcers), as well as verbal &/or behavioural signs (pulling at face, not eating, aggression)	

TOTAL SCORE: ___16___

- ☐ Organise for resident to have a dental examination by a dentist
- ☐ Resident and/or family/guardian refuses dental treatment
- ☐ Complete Oral Hygiene Care Plan and start oral hygiene care interventions for resident
- ☐ Review this resident's oral health again on Date: ___/___/___

Appendix G: Final Oral Hygiene Care Plan

Oral Hygiene Care Plan (OHCP) (Chalmers, 2004)

Resident: _____ **Completed by:** _____ **Date:** __/__/__			
Dentist: *public or private (please circle)* **Name:** _____ **Phone:** _____			
List all dental appointments: _____		**Date for next OHCP review:** __/__/__	
Dentures:	Upper	Full / Partial / Not worn/ No denture Named/ Not named Does/doesn't wear at night	Attempt denture cleaning: ☐ daily ☐ when possible
(please circle)	Lower	Full / Partial / Not worn/ No denture Named/ Not named Does/doesn't wear at night	Best time and person (staff/relative) to clean dentures: _____
Natural teeth:	Upper	Yes / No / Roots present	Attempt teeth cleaning: ☐ daily ☐ when possible
(please circle)	Lower	Yes / No / Roots present	Best time and person (staff/relative) to clean teeth: _____
Interventions for oral hygiene care ***(tick all that apply and circle frequency needed)***		☐ is independent and no assistance needed ☐ needs reminding / prompting / task breakdown ☐ needs supervision/ checking of oral hygiene ☐ needs full assistance from staff ☐ use bridging / chaining / distraction techniques ☐ use electric / suction toothbrush ☐ use toothbrush *normal/backward bent/ 2 toothbrushes* ☐ use chlorhexidine *spray bottle/gel daily/weekly* ☐ use fluoride *gel/mouthrinse in spray bottle daily/weekly* ☐ use regular 1000ppm toothpaste ☐ use extra-strength 5000ppm toothpaste *daily/weekly* ☐ scrub denture/s with soap and water *morning/night* ☐ soak denture/s at night in *water/denture tablet* ☐ use saliva substitute for dry mouth ☐ other _____ ☐ other _____	**Regular problems with oral hygiene care : *(tick all that apply)*** ☐ forgets to do oral hygiene care ☐ refuses oral hygiene care ☐ won't open mouth ☐ no compliance with directions ☐ is aggressive / kicks / hits ☐ bites toothbrush and/or staff ☐ can't swallow properly ☐ can't rinse and spit ☐ constantly grinding/chewing ☐ head faces downwards / moves ☐ won't take dentures out at night ☐ other _____ ☐ other _____ ☐ other _____

List of tables